

# PUBLIC WORKS

## Leaders in the Public Works Field



**Edward J. Cleary**

Appointed as Executive Director and Chief Engineer of the Ohio River Valley Water Sanitation Commission. He has been a distinguished staff member of the Engineering News-Record; is a registered professional engineer; and is, and for a long time has been, a leading spirit in the American Public Works Association.

*city  
county  
and state*

*February  
1949*

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In this library

Designing a Modern County  
Highway Garage

Economical Inhoff Tank  
Construction

Using a Salt Brine Well  
for Water Softening

Radiant Heat for Highway  
Snow Removal

Pennsylvania's Clean Stream  
Program

Studies for an Earthfill Dam

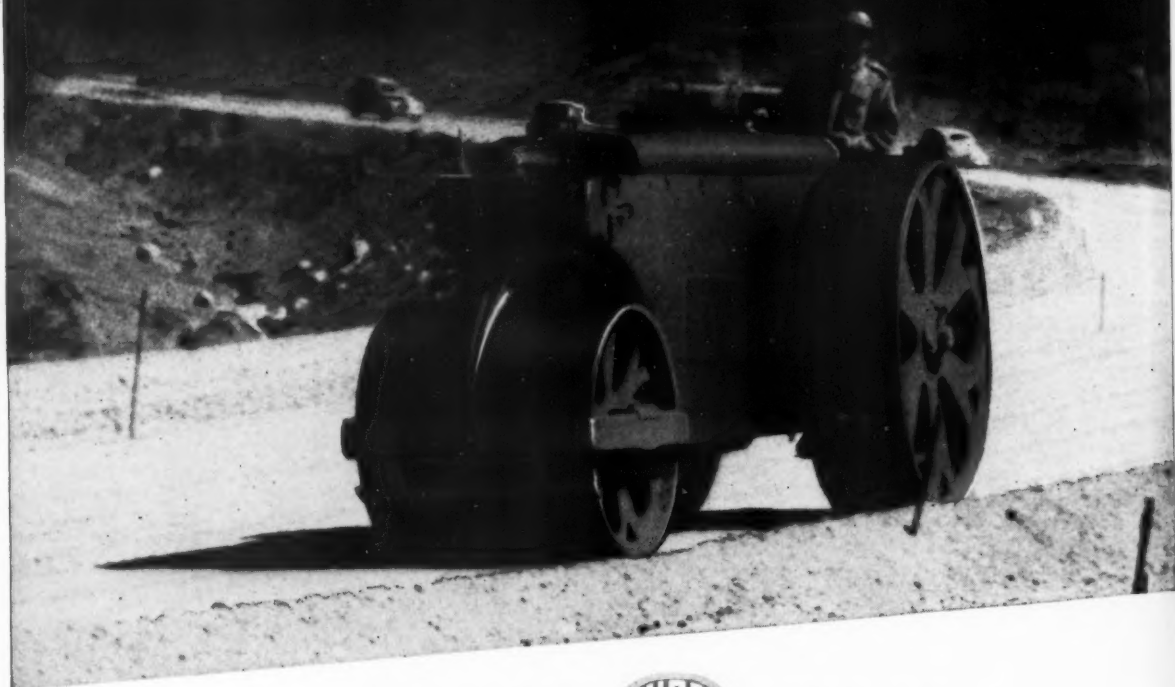
New York's Floating  
Underpass

Foreign Refuse Disposal  
Practices

Water-Sewage-Highway  
Up-to-Date Article  
Digests

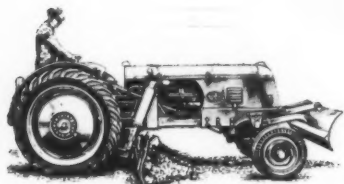
**DEPENDABLE!  
ECONOMICAL!  
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**Acclaimed by Road Men Everywhere . . .**

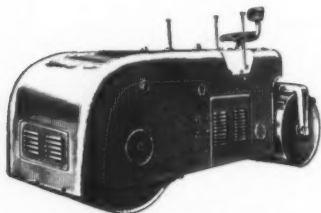


## THE NEW LINE OF 3 WHEEL ROAD ROLLERS

**"Built to Do a Better Job"**



THE HUBER MAINTAINER  
Seven machines in one



HUBER TANDEM ROLLERS  
5 Models — 3 to 14 Tons

Road men and contractors alike are setting their sights on the multimillion dollar construction program for 1949. To assure top profits throughout the year, and for years to come, smart operators are choosing Huber 3-wheel rollers for the tough compacting jobs ahead. They are known the world over for lower cost per mile performance . . . faster than average working . . . and longer life under all operating conditions. Modern in every respect the new Huber 3-wheel rollers are available in five models from 4 to 14 tons, gasoline or Diesel powered. Features include straight-line front end design . . . welded super-strength frame . . . anti-friction bearings throughout . . . heavy duty drive line with 3-speed transmission, both forward and reverse.

This year rely on the Huber line—tandem rollers . . . 3-wheel rollers . . . and maintainers to lick your compacting and maintenance problems. Write today for descriptive bulletins and name of your nearest dealer.



THE HUBER MFG. COMPANY  
Marion, Ohio, U.S.A.

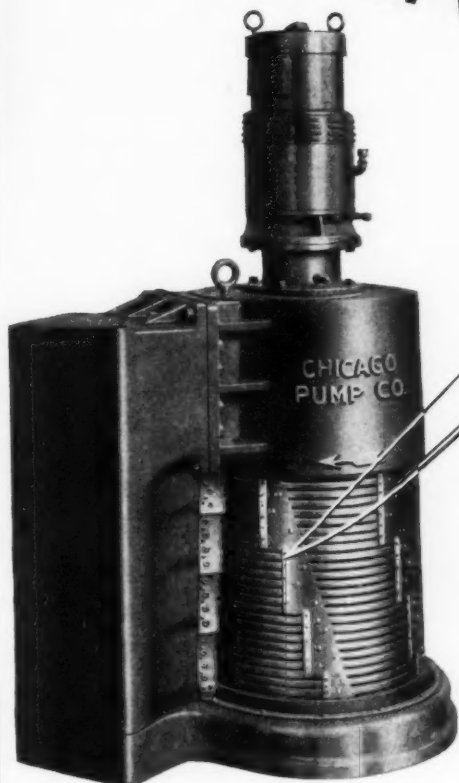
# HUBER

3 Wheel • Tandem  
**ROAD ROLLERS**  
and  
**MAINTAINERS**

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VOL. 8

**YOU CAN'T CUT WITH HALF  
A SCISSOR**



The 25A COMMINUTOR. This machine will handle flows averaging up to 10,000,000 gallons a day when set in a channel of proper design. The scissors point to the shear bars and cutting teeth on the slotted drum.

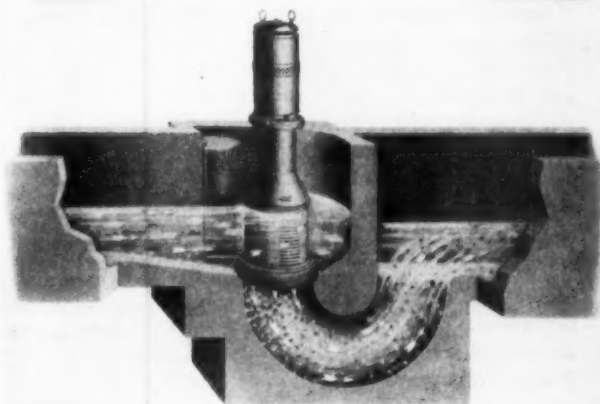
Cross section view of a typical channel design for the CHICAGO COMMINUTOR. Detailed drawings of acceptable channel forms are available to qualified engineers. For further information on COMMINUTORS, sizes, capacities and channel design write for Bulletin 185.

When you specify the CHICAGO COMMINUTOR you get both halves of the scissors.

The channel acts as the holding and feeding half of the scissors. The cutting teeth and shear bars of the COMMINUTOR drum make up the cutting half of the pair.

Years of research and knowledge gained through more than 2,000 successful installations prove conclusively that the hydraulic characteristics of the channel in which the COMMINUTOR is placed are as important as the cutting mechanism itself.

The form of the channel which makes effective comminution possible is an exclusive feature of the CHICAGO COMMINUTOR. Clogging and binding of coarse solids in CHICAGO COMMINUTORS is positively eliminated.

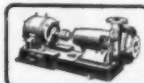


## **CHICAGO PUMP COMPANY**

### **SEWAGE EQUIPMENT DIVISION**

**2348 WOLFRAM STREET**

Flush Kleen, Scrub-Peller, Plunger.  
Horizontal and Vertical Non-Clogs  
Water Seal Pumping Units, Samplers.

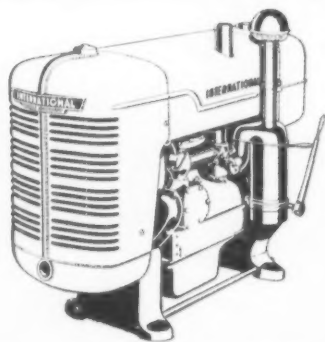


**CHICAGO 18, ILLINOIS**

Swing Diffusers, Stationary Diffusers,  
Mechanical Aerators, Combination  
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# **POWER** and **HEAT**

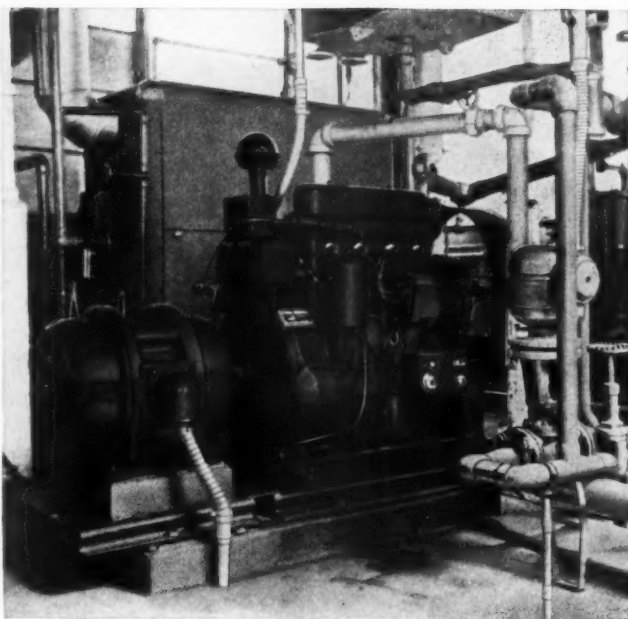
## **FOR LESS THAN 7¢ PER HOUR**



The International U-4 Power Unit, an efficient, economical 31½ horsepower engine, can be easily adapted to burn gas, distillate or gasoline. Like all International engines, the U-4 has highly efficient combustion, getting maximum power from minimum fuel.

For real, money-saving, power installations, your best bet is an International Power Unit. You'll find that it will pay real dividends to check your power requirements with your International Industrial Power Distributor or Dealer. He will help you choose the right International Power Unit, either Diesel or gas, to suit your power needs.

There are dozens of municipal installations such as pumping stations, standby electric power generators, sewage disposal plants—where International Power Units are the right answer to the power problem. It's wise to remember, wherever you need an engine, you need an International.



This International U-4 engine operates on waste sewage gas. The exhaust heats water for a sewage treatment process while the attached generator supplies electric power to drive sludge pumps and other power applications. The engine cooling system is connected to heat exchangers which heat water, and the building in winter. Active hourly operating cost, including maintenance, depreciation, lubrication and electric standby service, is only \$0.0639.

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CHICAGO**



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**CRAWLER TRACTORS  
WHEEL TRACTORS  
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Public Works is published monthly by Public Works Journal Corp. Editorial and advertising offices are at 310 East 45th St., New York 17, N. Y. Subscription rates: USA and possessions, \$3. All other countries, \$4. Single copies 35¢ each, except special issues which are \$1.

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# PUBLIC WORKS

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Founded in 1896

*The engineering authority in the  
city-county-state field*

**Edited by**

**W. A. HARDENBERGH and A. PRESCOTT FOLWELL**

**FEBRUARY, 1949**

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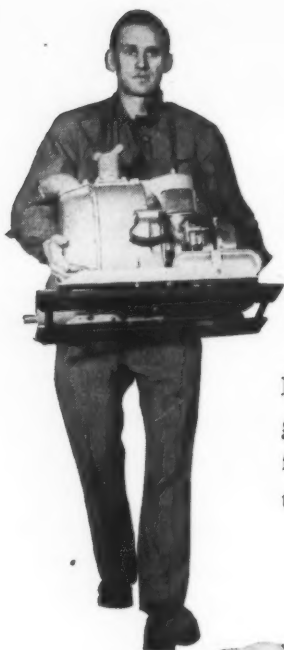
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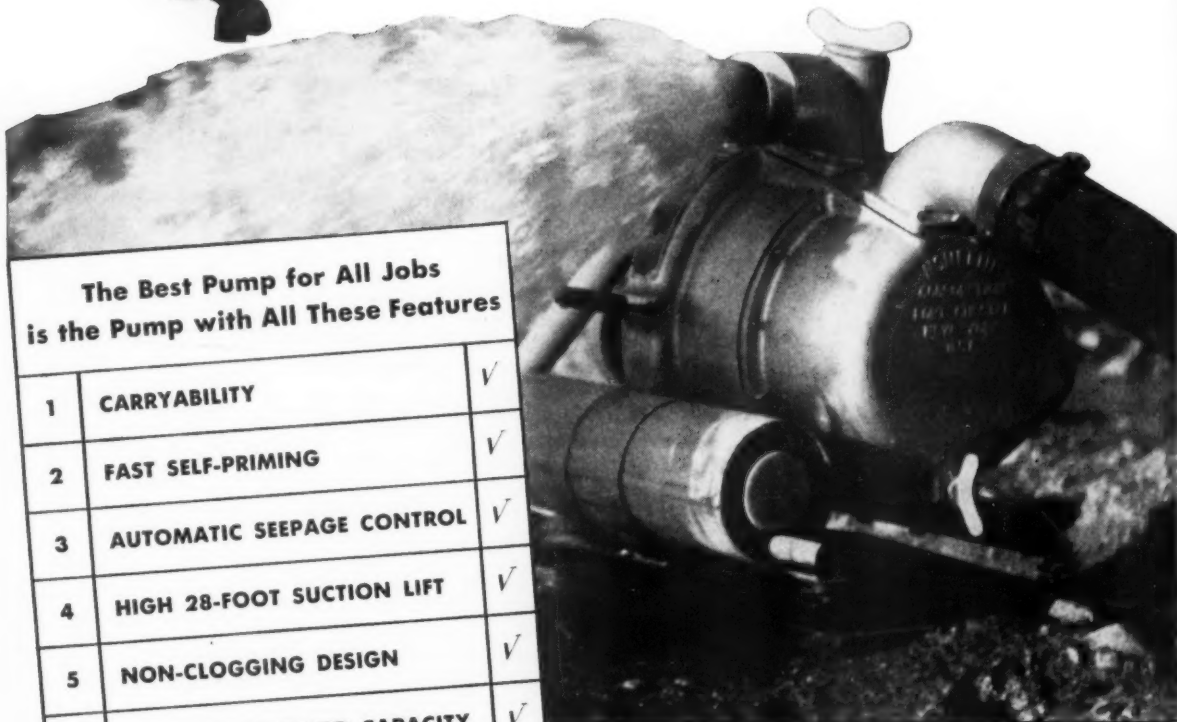
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## Homelite Carryable Pump ...with 9 Big Features

It weighs only 85 pounds... complete with built-in high-powered gasoline engine... and when it comes to performance, its nine big features are nine big reasons why a Homelite Carryable Pump is the best pump for all jobs... *your* jobs.



The Best Pump for All Jobs  
is the Pump with All These Features

1	CARRYABILITY	✓
2	FAST SELF-PRIMING	✓
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Write today for our new illustrated bulletin No. L-503 that tells the complete story and shows how you can get faster, better pumping with Homelite Carryable Pumps.

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2102 RIVERDALE AVENUE, PORT CHESTER, NEW YORK

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# The Editor's Page

## More Public Works Construction Probable

At this time it appears that the volume of private construction during 1949 will be no greater than it was in 1948, and probably will be less, while the volume of public works will be somewhat greater. The pent-up demands for such public works, dating back to the early days of the war, have not yet been satisfied and the volume of construction has been less than that needed to meet the deficiencies of the past 6 or 7 years. For 1949, the Federal Works Agency estimates 5 billion dollars of new construction for public works compared to 4.05 billion in 1948.

Many look on costs as being too high. It is true that they are higher than they were ten years ago; but a recent survey of construction costs shows that a dollar invested in construction bought, on the basis of 1939 averages, 23% more, during the first half of 1948, than a dollar invested in commodities. Other figures may show greater or less differences; and localities may vary also; but the fact seems to remain that construction costs are not out of line with other costs.

Meanwhile, doing without what is needed may be more costly than having it; and this applies alike to the new highway, the better and safer water supply, the needed sewage treatment plant and the better method of refuse disposal.

## These Radioactive Wastes

The disposal of radioactive wastes is a difficult problem and, as yet, no really satisfactory solution appears to have been found for treating them. This does not mean that the subject is not being studied earnestly, nor does it mean that no progress is being made. However, the matter is a highly confidential one and it is not possible to keep the engineering public fully informed of what is being done or can be done.

There has been some criticism of the engineers employed by the AEC for their unwillingness to make public all they know. Your editor, having been in somewhat the same boat during the war as they are now, appreciates the situation. He feels the program is in the hands of a group of excellent men, and he is quite willing to be patient while they develop and make public suitable and satisfactory treatment procedures. In the meantime, unfortunately, conjecture based on guesses will probably be indulged in.

## A Sound Highway Policy Is Needed

In view of the existing traffic volume now using our highways, and the congestion and accidents resulting, it is apparent that past highway policies and procedures, which have been dictated largely by the revenues available, will be inadequate to cope with the situation that has developed. On the basis of service-life expectancies, nearly 60% of the improved mileage now on the Federal-aid primary system will wear out within the next

10 years and will require some type of improvement, varying from resurfacing to complete reconstruction. It is essential that a program of the magnitude that is needed should be carefully planned and sufficient funds must be provided to enable the improvements to be made.

The cost of keeping an obsolete road system in operating condition is tremendous, and the eventual total cost of improving roads and streets to adequate standards increases with each year that action is deferred. The entire field of highway transportation needs to be re-analyzed in view of the present inability to keep pace with the new demands for service.

Sound highway policy requires: (1) Determination of the proper size and probable cost of owning and operating highway systems of the different classes; (2) an equitable plan for distribution of costs among highway users and general taxpayers; (3) allocation of authority and financial responsibility among the several levels of government; and (4) a plan for the regulation of highway use to protect users and obtain maximum service.

This statement is taken from the annual report of the Public Roads Administration, which adds the information that the initial steps in the solution of these problems are now under way. It is time; there is a tremendous task to be done; and it must be started quickly.

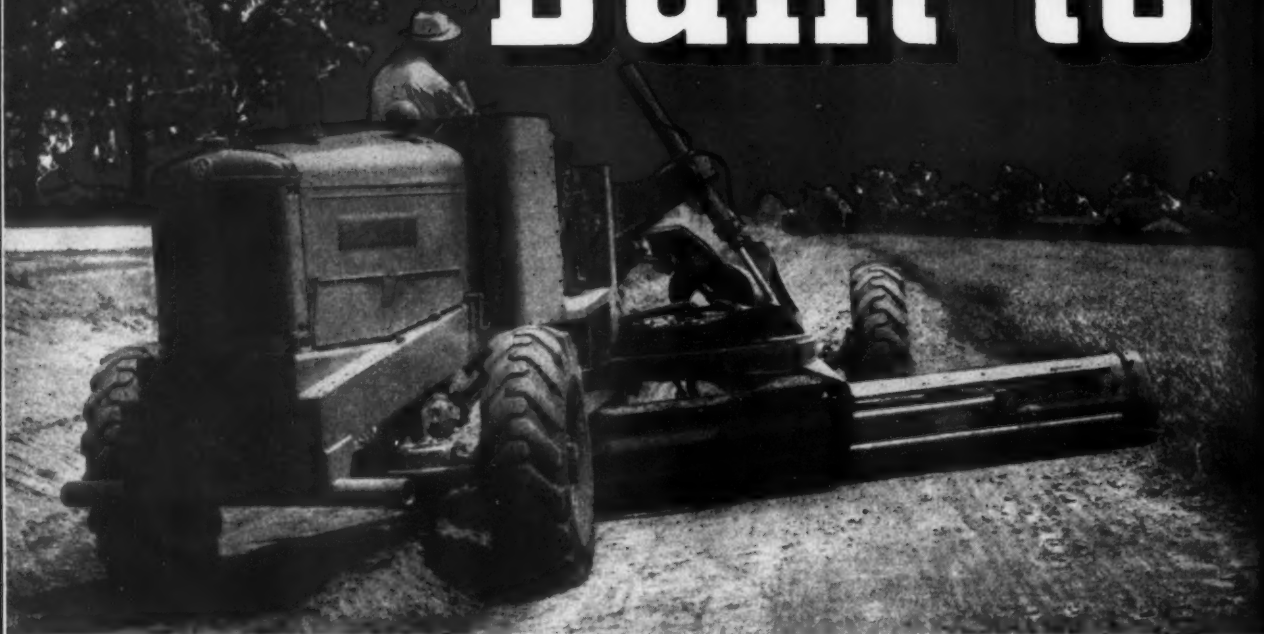
## That December Editorial

Comments are still flowing into this office in response to that "I've Had Enough" editorial in the December issue. They have come from all sections and from many groups of sanitary engineers. Most can be condensed into the simple statement made by several: "Amen, Brother." Some, while regretting the necessity (as did the writer) for the stand taken, concurred fully.

Since that editorial was written, some further data have become available. There are about 3,000 medical officers and 16 generals; there are around 750 dental officers and 4 generals; there are a couple of hundred veterinary officers and 1 general; there are about 1,020 medical service corps officers, no general and, we understand, all of one colonel. There isn't much nourishment for non-medical scientific personnel in those figures. Nor was any hope for future intelligent development of such skills developed in a personal conference; in fact, the previous feelings of hopelessness were confirmed. The present direction of this group lacks completely any understanding of the situation.

No one regrets the necessity for the action taken more than does the writer. There are many fine men in the medical department whom he has been proud to claim as friends. But there comes a time when the welfare of the country transcends personal feelings. Trying to justify fundamental errors never helped anyone or anything.

# Built to O



No motor grader without All-Wheel Drive and All-Wheel Steer can hope to equal the all-round operating efficiency of an Austin-Western "88-H," "99-H" or Master "99."

There are no idling front wheels; all weight is on drive wheels contributing 100% traction. All-Wheel Steer provides unequalled maneuverability; saves time on every job.

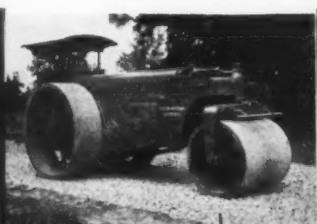


**BADGER CONVERTIBLE SHOVEL.**  $\frac{3}{4}$ -swing design eliminates tail swing; makes it possible to use the Badger in close quarters; reduces swinging weight and definitely increases work output. The Badger can be converted into a Crane, Dragline, Pile Driver, Trench Hoe, or Skimmer. Wheel mounts provide fast, easy job-to-job portability. A cab is available on special order.



**MODEL "40" MOTOR SWEEPER.** Fast, maneuverable, and economical in operation. No troublesome expensive conveyor or elevator to keep in adjustment and repair—dirt is thrown directly into the 2-yard hopper. Can be equipped with either right-hand or left-hand gutter broom or both. Leaf Broom attachment simplifies the collection of heavy accumulations of leaves.

**WHEEL MOUNTS.** Made in an unchanging frame 8 to 12 feet long, full length side plates, maximum rigidity, low weight, saving for annual operation. Hydraulic power steel, 42" dia. axle with 1000 lb. capacity. The Wheel Mounts provide quick machine change over and quick removal.



**TANDEM ROLLERS.** Variable weight type—45, 55 and 65 tons. Improved improvement—stands exceptionally smooth and steady performance on uneven and bumpy ground. Less side wear. More ground clearance. Lower water of gravity. Steering by efficient hydraulic control.





# OUTPERFORM



All-Wheel Drive and All-Wheel Steer make it easy for an Austin-Western Power Grader to do a superlative job of bank sloping. The operator can do all normal ditching

and grading; then high-lift the blade to any desired bank cutting position—including the vertical—*without leaving the platform.* No other grader can do it.



**PORTABLE CRUSHING PLANTS.** Built in sizes and types to fit every production requirement. Equipped with matching Crushers, Screens and Conveyors, correctly balanced to deliver the maximum amount of crushed and screened aggregate in controlled sizes. From the smallest plant to the magnificent "101" pictured above, every Austin-Western Portable Plant is engineered for low-cost tonnage.



**STATIONARY CRUSHING PLANTS.** This limestone plant with its two Jaw Crushers and Roll Reduction Crusher is typical of the efficiency of design that characterizes every Austin-Western plant. Two men control the entire operation; one at the Primary Breaker, the other to make the rounds of the matching Crushers, Screens and Conveyors. Each Austin-Western plant is tailor-made for its job.

**AUSTIN-WESTERN COMPANY • AURORA, ILLINOIS, U. S. A.**

BUILDERS OF ROAD MACHINERY  
**Austin Western**



# The NETCO CATCH BASIN CLEANER

With Pneumatic Controls

A Necessity For  
Every Municipality



- Simple
- Positive
- Powerful

## PNEUMATIC BUCKET

Although it has large capacity, the Netco Bucket will operate through an opening as small as 16 inches. This Bucket will easily remove sticks, stones, bottles, wire, and other such debris from all catch basins.



These Cities and Many  
Others Own One or More  
Netco Catch Basin Cleaners

Boston, Mass.  
New York City, N. Y.  
Indianapolis, Ind.  
New Brunswick, N. J.  
Harrison, N. J.  
East Cleveland, Ohio  
Binghamton, N. Y.



- The Netco Catch Basin Cleaner can be mounted on any short wheel base truck having at least 8 ft. in back of cab. You can purchase unit separately and mount on your own chassis.
- The Netco Unit can be removed from truck and chassis in 30 minutes.
- The Netco can be operated continuously because the material removed from catch basins is loaded into other trucks. This unit will average 20 to 30 catch basins per 8 hour day.
- The Netco Bucket closes pneumatically, assuring positive and maximum digging efficiency.
- Positive and simple control of pneumatic bucket, boom swing, hoist clutch and boom brake by compressed air.
- The Bucket is lowered and raised by one cable. Only one hose is required to close it, and it is opened by powerful spring action.
- The Netco has a hoisting capacity up to 1500 lbs.

## NETCO DIVISION

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When writing, we will appreciate your mentioning PUBLIC WORKS

## Letters

### THAWING PIPES

I have read with interest Mr. Purdy's article in the November issue of *Public Works*. I wonder if he could supply me with more data on the subject of unfreezing pipes by using a welding set, particularly as regards the amperes required for different sizes and lengths of pipe.

What is the effect of "hot spots" caused by joints which may be perfectly water-tight but are of high electrical resistance? What is the effect on lead piping?

I should be pleased if he could answer these questions from practical experience, as, short of carrying out a series of laboratory tests, there seems to be no way of obtaining the required data.

MAJOR W. J. STOODLEY,  
Royal Engineers,  
The War Office, (E. 12),  
Whitehall,  
London, England.

### NOTE TO FOUNDRIES

Please advise where we may obtain a complete description of the special fitting used for installing hydrants on tops of mains as described in the December issue of *PUBLIC WORKS*, page 45.

HARRY STEENSON,  
City Manager,  
Mt. Pleasant, Texas

Ed. Note: We have asked Mr. Hall of Lucas Co., Columbus, Ohio, and Mr. Wolfe of Cast Iron Pipe Research Assn. to furnish this information.

### MEDICAL SERVICE CORPS COMMENTS

"The undersigned . . . wish to extend sincere congratulations on your 'I've Had Enough' editorial." (Signed by seven engineers) . . . "I was pleased beyond words . . . My reaction is 'ME TOO.' (Massachusetts) . . . Congratulations on your stand in regard to the old Sanitary Corps." (Consulting Engineer, Ohio) . . . "You hit the nail on the head." (City Manager) . . . "Amen Brother." (Sanitary Engineer). . . "It did my 67-year-old heart good." . . . (Consulting Engineer).

Ed. Note: These are a small but fairly representative sample of written comments. This note will thank our readers and acknowledge the comments which are too numerous to answer individually.

### SEPTIC TANK INSTALLATION

Circumstances required a septic tank to be installed 21 ft. below ground level and a twin pump unit installed to elevate the effluent to the disposal field. Realizing the difficulty of cleaning the

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tank by usual methods, a 12-inch opening was placed between the sludge chamber and the pump sump so that the one pump unit could be used for both jobs; and a separate line was provided for discharging the sludge to a tank truck for removal. The application may be unusual and perhaps interesting to others with a similar problem.

STEPHEN H. EXCELL,  
Prof. Eng.,  
Spokane County Health  
Department, Wash.

## ROAD WORK IN GREECE

I am interested in obtaining the names and addresses of American contractors doing road and street construction work in Greece; also, I would like to know, if possible, the extent of such work being carried on there. Please advise me where I can get this information.

G. A. ADAMS,  
2911 W State St.,  
Milwaukee 8, Wisc.



Some of the details in constructing 18-inch VC Sewers in Queens, N. Y. Note steel forms for bedding support and method of jointing.



A fleet of 10 Eagle Truck-mounted loaders for the West Va. State Highway Commission. These will be used on snow removal and material handling. Each will move 5 cu. yd. per min.

Battery of five R-C multi-stage, Centrifugal Gas Exhausters driven by steam turbines.

**CENTRIFUGAL**

*R-C dual-ability plays no favorites!*

**ROTARY**

Standard Rotary Positive Blower, Type RCD, built in 8" to 22" gear diameters.

With a wide choice of Centrifugal and Rotary Positive Blowers available, you can usually select standard R-C units to meet your specific applications. Capacities range from 10 CFM to 50,000 CFM or higher for special requirements. Roots-Connorsville is the only blower manufacturer offering you this dual choice.

We're impartial as to drives, too. We supply them or you can utilize drives already available. Direct motor, speed changer or V-belt, steam turbine, gas engine or other modern types provide high-efficiency operation for R-C units. That's another phase of R-C dual-ability.

With R-C equipment on the job, you'll enjoy long-time, trouble-free performance. That's because of sound design and sturdy construction, based on 95 years of building gas and air handling equipment, exclusively. For any such problem, consult R-C dual-ability.

ROOTS-CONNERSVILLE BLOWER CORPORATION  
902 Poplar Avenue, Connorsville, Indiana

# ROOTS-CONNERSVILLE



BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

• • ONE OF THE DRESSER INDUSTRIES • •

When you need special information—consult the READERS' SERVICE DEPT. on pages 85-88





(1) This 101-year-old cast iron water main is serving Frederick, Maryland.



(2) Still in use after 118 years of service in the water supply system of St. Louis, Mo.

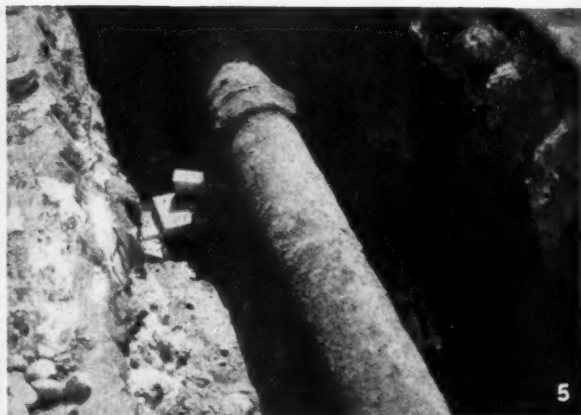
(3) This water main, installed 117 years ago, is still serving Richmond, Va.

(4) Lancaster, Pa. laid this cast iron water main 105 years ago. It is still serving.

(5) One of several cast iron water mains that have been serving New York City for more than a century.

(6) America's oldest cast iron water main, now in its 132nd year of service in Philadelphia.

(7) This cast iron water main has been serving Boston for 120 years.





## Going strong in their 2<sup>nd</sup> Century

About 30 of the older American cities have cast iron water or gas mains in service which were laid from 100 to 132 years ago. Most of these mains, on or after their 100th Anniversary, have been uncovered, inspected and photographed for the record. Seven of them—all water mains, are shown in this advertisement.

While it is well known that cast iron water mains in England, France and Germany have service records that approach three centuries, we, who make cast iron pipe, nevertheless get a thrill out of looking down into the trench at an uncovered section of a main that has been in service for 100 years—and so, we are told, do water works and gas engineers.

When one considers the radical changes which have occurred in a century in vehicular traffic, and the vast development of underground construction for the many utility services, the fact that these mains are now in their second century of service is all the more remarkable.



# 96%

OF ALL 6-INCH AND LARGER CAST IRON  
WATER MAINS EVER LAID IN 25 REPRESENTATIVE CITIES ARE STILL IN SERVICE.

Based on the findings of a survey  
conducted by leading water works engineers.

## CAST IRON PIPE

S E R V E S   F O R   C E N T U R I E S

Cast Iron Pipe Research Assn., T. F. Wolfe, Engr., Peoples Gas Bldg., Chicago 3.

When you need special information—consult the READERS' SERVICE DEPT. on pages 85-88



# Opposed-Piston diesel power

## **More Power in Less Space . . .**

Whether you're building a new power plant or are interested in obtaining more power in present plant facilities, consider this well: *Fairbanks-Morse Opposed-Piston engines require far less floor space than conventional Diesel engines of equal horsepower.* This might well make it possible for you to get additional power installed in floor space now available. For details, see the nearest branch office or write Fairbanks, Morse & Co., Chicago 5, Ill.



### **FAIRBANKS-MORSE**

**A name worth remembering**

DIESEL LOCOMOTIVES • DIESEL ENGINES • STOKERS • SCALES • MOTORS • GENERATORS  
PUMPS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS



# Setting A New High

## IN QUALITY AND VALUE

**V**ERTICAL TURBINE PUMPS, designed and built by Layne are available in sizes from 40 to 16,000 gallons per minute. Write for pump catalog.

TODAY'S Layne Well Water Systems and Vertical Turbine Pumps set an amazingly new high in long lasting quality and big dollar value. Years and years of constant improvements in design has given them unmatched over-all efficiency. And along with high efficiency there have been many improvements in quality. All strain points have been made heavier and stronger. All bearing surfaces are now tougher and longer lasting. Controlled precision in manufacture has added more smoothness to operation.

All in all, your Layne Well Water Systems and Vertical Turbine Pumps of today produce more water at lower operation cost than ever before. Dependability in construction features is not limited to a season or two. They are there to provide service for years and years with little or no upkeep expense.

But you will also be interested to know that if service of any nature is ever required, the Nation-wide Layne organization has the facilities and know-how to put your system back in perfect order with a minimum loss of time. Layne Well Water Systems are—"Better Built for Better Service."

**LAYNE**  
WELL WATER SYSTEMS

For further information about Layne Well Water Systems and Layne Vertical Turbine Pumps, write for catalogs and bulletins. No obligation. Address

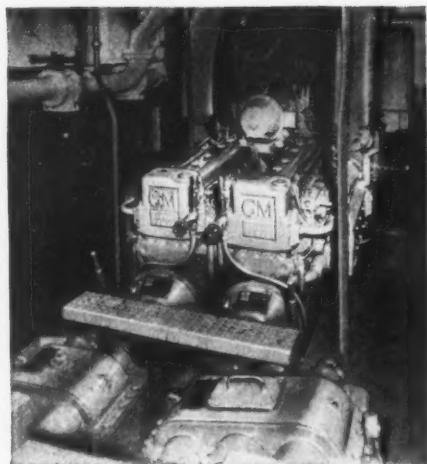
**LAYNE & BOWLER, INC.**

General Offices

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**AFFILIATED COMPANIES**—Layne-Arkansas Co., Stuttgart, Ark.  
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Heart of the Bernard Samuel is this GM Series 71 Quad. Each engine can be individually declutched and turned to pumping duty as the need demands. With a speed of 17 m.p.h., she can shift from full speed ahead to full speed astern in seven seconds.



Philadelphia's new fireboat, the Bernard Samuel, designed by Thos. D. Bowes, M. E., prominent Naval Architect, measures only 75 ft., yet packs all the punch of her larger predecessors and, at the same time, far surpasses them in economy and flexibility. She pumps better than 5,500 gallons per minute at 150 pounds nozzle pressure.

## Brand-New Idea in fireboat design

THE Bernard Samuel's small size and great versatility can, in large measure, be attributed to her power plant—an 800 H. P. General Motors Series 71 Diesel Quad-6. Because of its compactness and greater power-per-pound 2-cycle design, this engine takes up less space—leaves more room for equipment. GM Diesel's instant, push-button starting enables the boat to get underway in a

hurry when the alarm sounds.

The same characteristics that made GM Diesels the choice of the Bernard Samuel's designer make these engines ideal for both pleasure and work boat power.

Write Detroit Diesel Advertising Department for free booklet "The New Idea in Fireboats" which gives the full story of the Bernard Samuel.

### DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES . . . Up to 200 H.P.

DETROIT 20, MICHIGAN

MULTIPLE UNITS . . . Up to 800 H.P.

GENERAL MOTORS

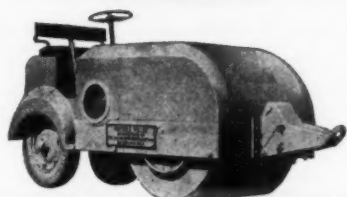
**DIESEL BRAWN WITHOUT THE BULK**



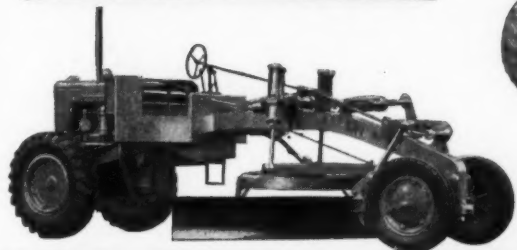


# GALION

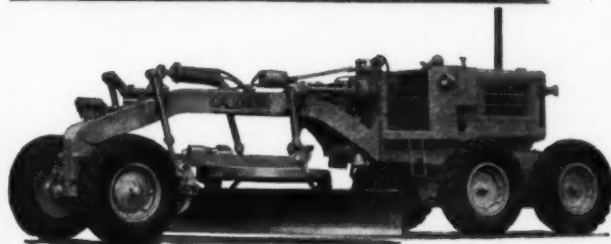
-an Old Name  
that Stands for the  
Newest and Best in  
ROLLERS and GRADERS



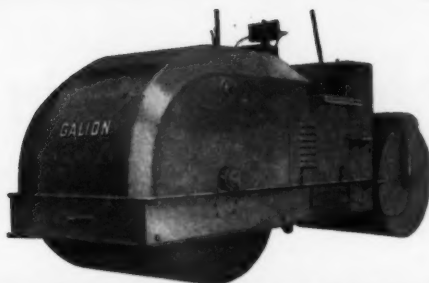
**PORTABLE ROLLERS**  
for Patching and Odd Jobs.



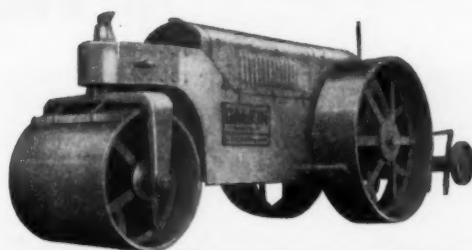
**NO. 402 MOTOR GRADER, 31 H. P.**  
for economical Maintenance Work.



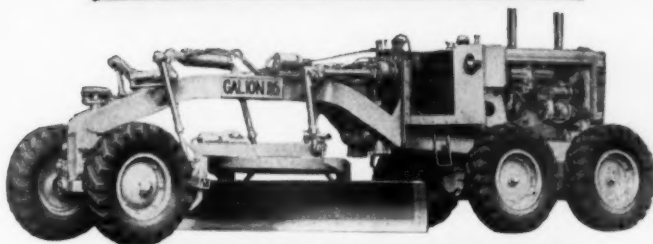
**NO. 103 MOTOR GRADER, 76 H. P.**  
for Heavy-Duty Service



**TANDEM ROLLERS, Four Sizes—**  
variable in weight from 3 to 14 tons.



**THREE-WHEEL ROLLERS, Five sizes—**  
6, 7, 8, 10 and 12 tons.



**NO. 116 MOTOR GRADER, 100 H. P.**  
for Extra Heavy-Duty Service

In the heavy construction field -- among contractors, engineers, and users who know equipment best -- GALION Graders and Rollers have long been regarded as being tops in performance, dependability, and profitable service.

Write for literature on the type of equipment in which you are interested -- and the name of nearest Distributor.

**THE GALION IRON WORKS & MFG. CO.**

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Galion, Ohio, U. S. A.

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# GALION

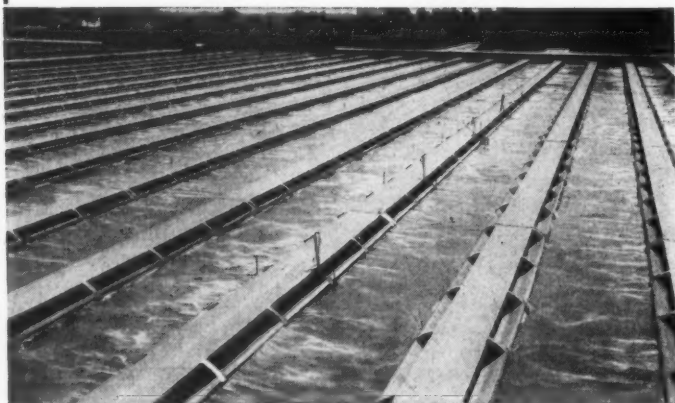
Estab. 1907

## GRADERS • ROLLERS

When you need special information—consult the READERS' SERVICE DEPT. on pages 85-88

# Performance in World's Largest Sewage Treatment Plant...

**...leads to extended use  
of Everdur Electrical Conduit**



Everdur Electrical Conduit serves the aeration and final settling tanks in bringing power from the operating galleries to the sluice gates of the control centers, and from these centers to the operating mechanism on the center pier of each tank.



General view of Southwest Treatment Works. Chicago, world's largest activated sludge sewage treatment plant.



Everdur Electrical Conduit in service tunnel looking north from north gallery.

WHEN Chicago's Southwest Sewage Treatment Plant was built twelve years ago, it utilized 14 miles of Everdur® Electrical Conduit, in sizes from  $\frac{3}{4}$ " to 2 $\frac{1}{2}$ ". Conduit of Everdur Metal was selected because of its high physical properties and excellent resistance to many corroding agents.

More and more Everdur Conduit has gone into this plant, as its 1939 capacity of 400 m.g.d. had been expanded to 1,000 m.g.d. at mid-1948. Further expansion will take place over the next 5 years. Considerable Everdur Conduit is specified in several new contracts awarded to the Northern States Electric Company, Chicago.

For detailed information on Everdur Copper-Silicon Alloys in Sewage and Water Works service, write for Publications E-11 and E-5.

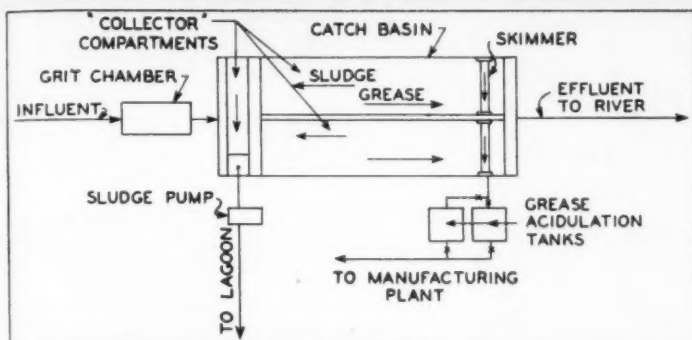
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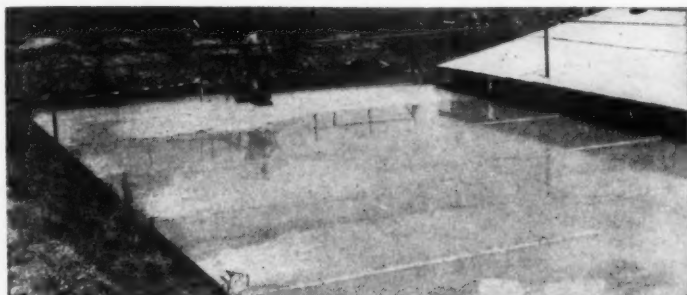
  
**Everdur**  
**COPPER-SILICON ALLOYS**  
**THE AMERICAN BRASS COMPANY**  
 General Offices: Waterbury 88, Connecticut  
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 New Toronto, Ont.

When writing, we will appreciate your mentioning PUBLIC WORKS

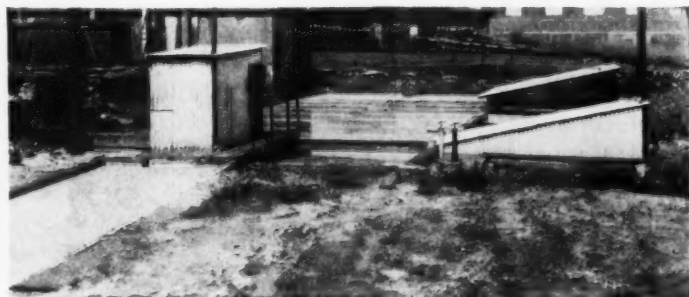
# LINK-BELT sludge collectors recover 1100 lbs. of valuable grease daily



Flow diagram of industrial waste treatment plant at Delany & Co. glue works. Link-Belt equipment collects sludge, recovers grease, assures excellent performance.



Looking toward effluent end of catch basin. The cross pieces seen on liquid surface are the redwood conveyor flights of two parallel Link-Belt sludge collectors. These flights are slowly moving the floating grease to effluent end of tank, where operator will skim it off by hand-lever operation of a Link-Belt Rotoline grease skimmer.



General view of waste treatment plant as seen from influent end of catch basin. Grit chamber appears at left.

## LINK-BELT COMPANY

Philadelphia 40, Chicago 9, Indianapolis 6, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

## Increase Operating Efficiency.....

Recovery of 1100 pounds of valuable grease every day is achieved through the installation of Link-Belt sludge collectors and Link-Belt Rotoline grease skimmers in an existing waste treatment catch basin at the glue manufacturing plant of Delany & Co., Inc., Philadelphia, Pa. The operating efficiency of the catch basin also was increased, although the rate of flow of industrial waste averages 47,500 gallons per hour.

Link-Belt equipment — including screens, sludge collectors, mixing, aerating, conveying and driving machinery—has long been "first choice" of consulting engineers, public officials and industries where solids and grease are removed or reclaimed from waste water. This durable, dependable equipment is designed and manufactured in our own plants.

11,310

# LINK-BELT

SCREENS · COLLECTORS · MIXERS · AERATORS

# for a Cleaner City...a Lower Budget...



it's the  
**DEMPSTER  
DUMPSTER**  
TRADE MARK REG.  
system!

Three great advantages of the Dempster-Dumpster System are **SANITATION, CLEANLINESS** and **ECONOMY**. Its sanitation and cleanliness are due to the completely enclosed steel containers which receive trash and rubbish as it accumulates. Once the rubbish is inside container, it can't be scattered and littered over streets and alleys by wind or scavengers . . . and, more important, it can't be contaminated by rats or flies. Its economy and efficiency of operation are naturally attractive to any **BUDGET-MINDED** Municipality. When you consider that one Dempster-Dumpster truck hoisting unit and one man, the driver, can handle a large number of these detachable containers and serve an amazingly large area of your city, for bulk trash and rubbish collection, you'll realize why one Dempster-Dumpster can do the work of 5 to 10 conventional trucks and crews. Savings in gas, oil, tires, maintenance and equipment investment is amounting to thousands of dollars annually to cities like Baltimore, Richmond, Birmingham, Pensacola and scores of other large and small municipalities. The simple operation of this system is illustrated in the photographs at right. Ask today for complete information.



The amazingly simple stages of picking up, hauling and dumping the detachable containers are shown in the three photos above. In the top photo, driver has backed the truck hoisting unit up to an 8 cu. yd. Apartment Type Container, attached two chains and returned to the hydraulic controls in the truck cab. In center photo, container has been hydraulically lifted into carrying position ready for hauling to disposal area for automatic dumping as shown in the bottom photo.

## DEMPSTER BROTHERS, Inc.

9118 Dempster Bldg.

Knoxville 17, Tennessee

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# Save...

## Time, Money and Labor in making pipe joints

“ “ “ *The only field equipment  
necessary to make a Universal  
Cast Iron Pipe Bolted Joint is  
a Ratchet Wrench.*



by using

### UNIVERSAL\* CAST IRON PIPE

(PIPE and JOINT are ONE)

#### Outstanding Advantages:

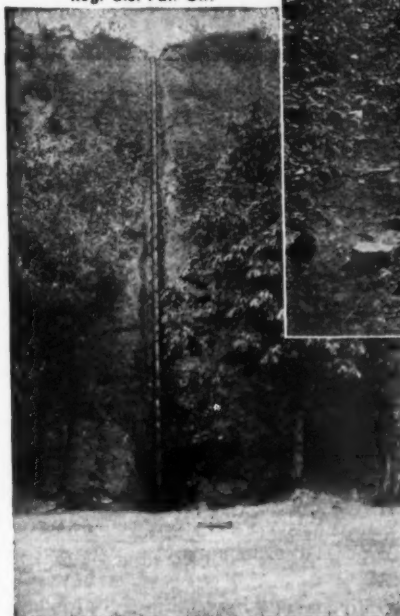
- ① No calking or pouring of lead or lead substitutes. No gaskets used.
- ② No bell holes to dig. Can be laid in a narrow trench. Cost of wide trenching is eliminated.
- ③ Can be laid with **SPEED**. Easier and cheaper to install because only two bolts need to be inserted in the lugs, tightened with a ratchet wrench (the only tool needed), and the completed joint is made in a few minutes. Experienced workmen are not needed.
- ④ Nothing to deteriorate; nothing to work loose; no leakage; no maintenance cost.
- ⑤ Flexibility: Universal pipe is very flexible. It withstands expansion, contraction, unequal settlement, vibration and shock, and electrolysis. Many curves are laid with straight lengths and do not need special fittings.
- ⑥ Universal pipe can be laid on rocky soil, under water and in sub-zero weather.

**Specify UNIVERSAL PIPE  
for water mains and sewers**

Furnished in hot tar dipped, cement lined, and enameline lining.

**THE CENTRAL FOUNDRY CO.**  
386 FOURTH AVENUE, NEW YORK 16

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**Above** All straight lengths of Universal pipe in this curve.

**At left** 16" pipe laid on a 45-degree slope. Note deflection at ten to level ground without fittings.



**USE THE  
COUPON**

DEPT. C

#### THE CENTRAL FOUNDRY COMPANY

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I am interested in **SAVING LABOR, TIME, MONEY and EQUIPMENT** in pipe-laying. Send me the **UNIVERSAL** catalog.

Name .....

Position .....

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# *Don't let High Costs Sabotage your Sewer Budget*



It's true that material and labor costs are higher, but they need not undermine your sewer budget. You can make substantial savings on material costs in larger sizes by using ARMCO Sewer Pipe. Even better, you can save up to 25 per cent of labor costs. This is how it is done . . .

ARMCO Corrugated Metal Pipe is light in weight, easy to haul and handle, using only ropes and plank skids. Long lengths mean fewer joints—less assembly—faster installation. No special foundations are required and no time is lost in curing. Unskilled labor quickly makes tight joints with simple band couplers. On extra large sewers sturdy, prefabricated MULTI-PLATE Sections are delivered to the site ready for speedy, low-cost installation.

You will also find other advantages in ARMCO Sewer Structures. Install them under railways and highways without worry of breakage or loading failures. There is a size and type for every purpose.

ARMCO PAVED-INVERT Pipe combats erosion. ASBESTOS-BONDED Pipe provides all the durability you will ever need. Where headroom is limited ARMCO PIPE-ARCH saves time and labor.

An ARMCO Engineer will be glad to demonstrate how you can save time and money on your specific problems. Ask him about ARMCO Sewer Structures before figuring that next job. Armco Drainage & Metal Products, Inc., 855 Curtis Street, Middletown, Ohio. Export: The Armco International Corp.



**ARMCO SEWERAGE PRODUCTS**

# Economical Imhoff Tank Construction

**V. A. VASEEN**

Assistant Engineer  
Ripple and Howe

Consulting Engineers, Denver 2, Colorado

**A**N Imhoff tank, conventional in every way but one, was built in Palisade, Col., in 1939. In it, the sludge storage chamber was divided into two sections and a concrete slot gate added which was designed to permit the operator to divert sludge, at will, to either storage side. This plant was built when labor and ma-

terials were cheap, by present standards, and it mattered little if an extra yard or so of concrete was used, if its use produced a more efficient plant, which it did.

The separating of the sludge collection or storage chamber into two separate sections proved to be an exceptionally good idea. The operator could add raw sludge at will to one side of the tank until close to capacity and then throw the gate to the opposite side, thus, preventing the closed off chamber from receiving any more raw sludge. The net result was a better digested sludge

with no green sludge placed on the drying beds. This meant less bed space required, more gas for burning trash in the incinerator, and less "floating digesting sludge" rising through the slot and consequently over the effluent weir.

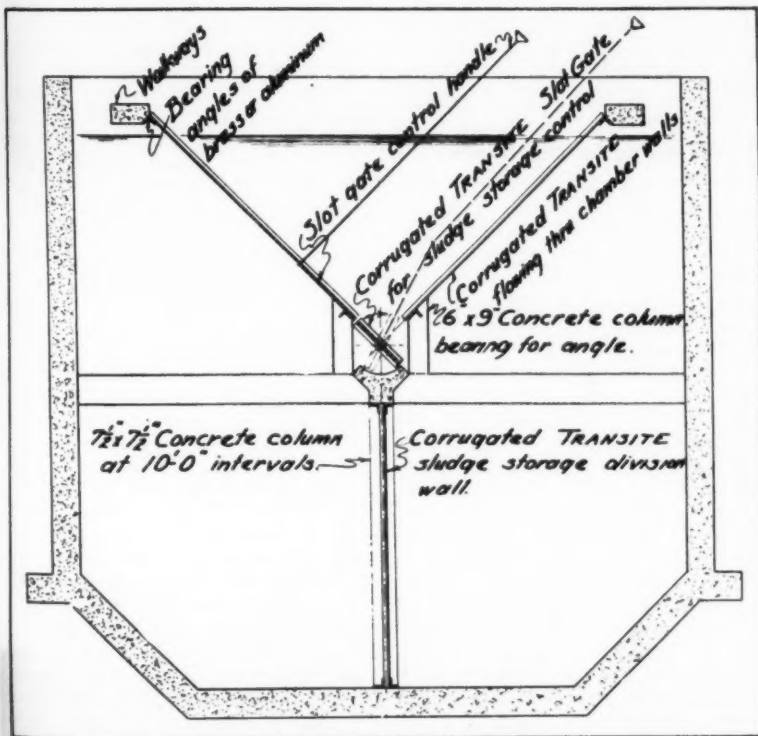
Similar plants with concrete slot gates were built in Colorado at the Pueblo Ordnance Depot; Cortez; Durango (two plants); and Cheyenne Wells. All gave equally good results. However, when the Leadville, Col., housing project plant was designed in 1944, costs had risen and substitute materials were investigated. The plant was built with timber flowing-through chamber walls and gate. Timber design was good, but due to its buoyancy extra precautions had to be taken to anchor the structures, and there was also the problem of expansion due to swelling. Timber work is also expensive, sometimes as high as concrete.

## Transite for Walls

Since the war two plants have been built and another designed using corrugated Transite as the structural material for the flowing-through chamber walls, the slot gates, and division wall. Transite has many advantages as well as being about one half as expensive as reinforced concrete.

Corrugated Transite is made of asbestos fibre and cement, formed under great pressure into dense, unlaminated, monolithic sheets possessing high strength, rigidity and durability. Corrugated Transite is exceptionally resistant to acid fumes, alkaline vapors, adverse atmosphere conditions, extremes of sudden temperature changes, and alternate wet and dry conditions. Like most cement products, Transite also becomes tougher and stronger with age. Cor-

(Please turn to page 34)



Changeover baffle for Imhoff tank.

# Designing and Building a County Highway Garage

A. J. MOON

County Engineer, Wyandot Co., Ohio

**W**YANDOT County is almost square, 21 miles each way. We have 303 miles of county highways to care for. These are distributed over the County area in an almost uniform pattern. Since Upper Sandusky, which is the County seat, is almost in the center of the County, we have the center of our operations here.

Our headquarters, for many years, was an old livery barn, next to the Court House, right in the center of town, where we had an area of 8250 sq. ft. Since this was not adequate space, we had equipment stored at the County Fairgrounds, two miles away, which had to be moved each year at Fair time; and at other places also. As a result, we lost considerable time in locating equipment, and some equipment was actually lost. Also, our quarters were of old timber construction, a menace to adjoining property, and the cause of high insurance rates.

We began to plan for a new highway garage several years ago. We looked around for a good site and visited neighboring counties, asking questions about garages and garage equipment. We learned that it paid to see how men built who are in the garage business; and we found them friendly and willing advisors.

We located and purchased an excellent site of  $3\frac{1}{2}$  acres of well drained land which lies between a State Highway and the C & O Railroad. We have a spur through this site which, though it serves two other business places, gives excellent service; there is also access to good highways and the location is uncrowded.

Wyandot County has the following equipment, which is used in our construction and maintenance work:

Two sedans and one carryall; eight motor trucks,  $\frac{1}{2}$  to 3 tons, Ford, International, Dodge and Chevrolet; two distributors, one 540-gal. on a Chevrolet truck and one 1000-gal. on an FWD; a Hanson power crane and a Hanson 15-ton trailer; a Galion 101 grader; two Galion rollers, 7-ton and 5-ton patching; one International and one John Deere mower; one General bucket type loader; three one-bag Jaeger concrete mixers; a Cleaver-Brooks tank car heater; two stone



Gasoline pump, island and power entrance at south end of garage.

spreaders; a Jaeger 105 compressor; a Hough road broom; a sand blast outfit; and six snow plows. In addition, there are the usual miscellaneous items, including sand and cinder spreaders, torches, barricades, signs and small tools.

## Planning for Our Needs

After careful consideration of this equipment list, and making due allowance for what we considered to be a reasonable increase of equipment, we decided to construct a single story garage building. The inside dimensions were set at 80 ft. by 180 ft., which would give us 14,400 sq. ft. of floor space. We decided to set aside floor space into the following areas: Office, 15 ft. x 30 ft.; stock room, 30 ft. x 30 ft.; paint room, 30 ft. x 20 ft.; and repair shop, 45 ft. x 48 ft. Out of the latter was taken a 15 ft. x 20 ft. space for wash room. The rest of the building, 10,720 sq. ft., is used for the storage of equipment. This is adequate for our present needs. Should the future require additional equipment storage, we have room on our site for additional structures where the equipment which is used only in the summer, and which may be safely stored in unheated buildings may be kept. Thus we hope to escape the cost of additional heated buildings.

Though our plans were ready in 1941, the construction was not begun until the fall of 1945.

We are in glacial deposit territory, and much of the land is underlain with quicksand. Consequently we carefully investigated our site. Although we found a good substantial clay at our footer elevations, we decided to construct substantial foundations, since our building is within 150 feet of the C & O Railroad, which hauls extremely heavy coal trains, and causes considerable vibration. The sidewall and interior wall footers are 24 in. wide, and 12 in. thick, reinforced with four continuous  $\frac{5}{8}$  in. bars. The end wall footers are 28 in. wide and 12 in. thick, with the same reinforcing. The side and interior foundation walls are 12 in. thick, the end foundation walls are 16 in. thick. All are centered on the footers and reinforced with  $\frac{1}{2}$  in. reinforcing steel, spaced 12 in. on centers, horizontally and vertically, with the vertical rods extending into the footers. There are no expansion joints in the foundation walls. All construction joints were made at a pilaster. Drain tile were laid all around the building at the bottom of the footers, and covered with porous backfill about 3 ft. deep, over which the earth backfill was placed. The top of the foundation wall was established as the eleva-



tion of the top of the floor inside the building, which is a foot above the outside grade elevation. As soon as the foundation walls were placed we filled the entire floor area up to the top of the foundation with good clay, rolled and tamped thoroughly, upon which was placed a layer of crushed bank run gravel. Subsequently all the materials for the walls were piled inside the foundation walls and the construction operations helped compact the fill.

### Wall and Roof Construction

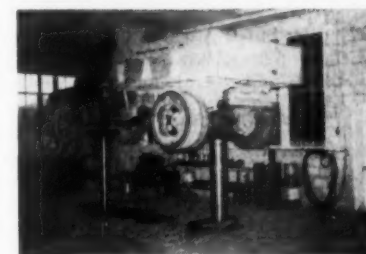
The exterior walls of the building are made of reclaimed highway paving brick. We had secured 80,000 of these when U.S. 30 N. was rebuilt in 1938, at what we thought to be a bargain. Because of the extreme density of these brick, and their lugs and rounded corners they are hard to lay into a nice wall. But by being careful not to lay them too high on green mortar, and by carefully wiping all the joints, a good wall of pleasing appearance can be built. These brick had to be carefully sorted when laid and we found that we had four various sizes. If we were to do it again, we would prefer not to use the reclaimed paving blocks, although we did get a nice job with them.

We used concrete blocks to construct the interior walls. We placed wood window frames in the interior walls. The windows in the exterior walls are ventilated steel sash. We used as many windows as possible.

We secured a Manufacturers Stand-

ard bowstring truss, with a circular top chord, to support the roof. We suspended a ceiling of  $\frac{1}{2}$  in. Celotex from the bottom chord of the roof trusses. This ceiling is 14 feet above the floor. We placed ventilating louvres in each end of the building to prevent a dead air space. These we covered with copper screening to keep the birds out of the attic. Our electric wiring is in rigid conduit in the attic, but we insist that nothing else shall ever find its way into the attic. We placed Armco's Paint Grip Galvanized Steelox Roof Deck by welding it to the trusses, and to the supporting steel which we anchored to the end walls.

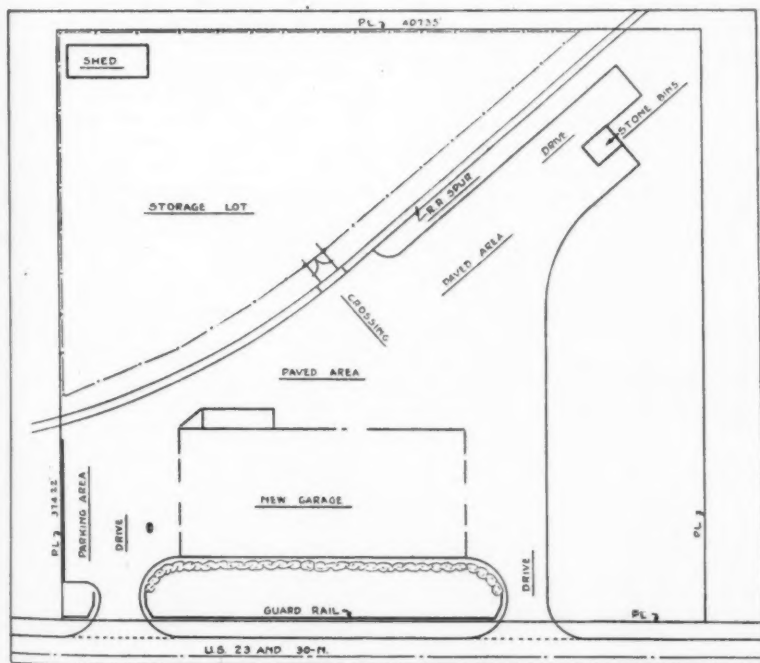
In order to secure a 20-year bond for our roof we had to place  $\frac{1}{2}$  in. thick Celotex on the steel roof deck. First we mopped a felt paper over the steel roof deck. Next we nailed five wood strips 4 in. wide and  $\frac{1}{2}$  in. thick to the roof—one at each eave, one on the center of the roof, and one on each side of the center—dividing the roof surface into four equal strips. These  $\frac{1}{2}$  x 4 strips extend full length of the building. Next the Celotex was cut into blocks about 2 ft. x 4 ft. and cemented between the blocks. Then the built-up roofing was mopped on, nailing each strip except the last cover strip to the wood strips. The roofing material was mopped and rolled on from eave to eave, carefully lapping as required. Next the eave flashing was nailed down, a cover strip mopped on and the final coat of asphalt roofing covering mopped over the whole



Interior working views of the Wyandot County garage. Top, paint shop; next, repair shop, showing 1 1/2-ton chain fall; next, battery bench, spark plug cleaner and battery charger; bottom, lubrication center.

roof. By nailing the bottom layers of asphalt roofing to the wood strips, a tendency to creep and wrinkle, or sag is prevented. Our roof has gone through two winters and two summers and looks perfect. We used copper flashing, gutters and downspouts.

Since we were so fortunate as to secure a site, so well situated, and so nearly the right size, we spent considerable time in planning the location of our main garage building, parking areas, etc. Fearing that some one might wish to cut down the size of our establishment in the future, we have proceeded to place our permanent buildings on concrete foundations in the locations shown on the accompanying site plan—setting them



Ground layout and garage location.

as near our outer boundaries as reasonably possible.

We felt that safety required that entry to the garage site should be limited to two driveways. We constructed a guard rail to keep people from driving off the street into our lot except at the driveways, and planted a row of shrubbery along the building and driveway edges, and planted the enclosed area to grass. This is our only attempt at beautifying the site, except that we insist that nothing will be thrown outside or leaned against the building, and that the place must be kept clean.

Having been crowded for so long, and having seen so many new garages built on too small a site, we thought that adequate parking area and pavement area outside the garage would be an advantage, and well worth the cost. Accordingly, in 1946, we cleaned out the area around the garage building and graded the subgrade for our parking area and driveways. These were built with an 8-in. waterbound macadam base, well rolled and bound in thoroughly. We then applied a prime of RT-3 on and then a double surface treatment of RT-8 and No. 6 stone. Then, although we had no heat and no plumbing installed, we moved into our garage for the first winter. We found 3 old furnaces which we distributed about the building with the flues sticking out through the windows and got along fairly well.

### Radiant Floor Heating

It was our original intention to heat the building with a stoker fired steam boiler, using overhead blower units. But we had seen some articles about "radiant floor" heating and secured the consent of the Commissioners to change our heating system to the new radiant floor. We purchased the necessary hot water boiler and wrought iron pipe, and the material was delivered in the winter of 1946-47. We found a contractor to install our heating system the next summer and proceeded to get ready for the installation.

During the winter, when we could find the time to do so, we removed the top 12 in. of fill from the floor area carefully sloping the floor to the contour desired. We then hauled in and placed a layer of No. 7 limestone 6 in. deep all over the floor, thoroughly wet down and compacted. This was to act as an insulation course below the heated floor slab.

The floors in the office, store-room, repair shop, and paint shop are level, while the floor in the equipment storage room was built to slope from all four sides to the center, where a narrow concrete trough, covered with an open grating, carries any water into

a standard 2 ft. x 2 ft. concrete catch basin which is connected to the outside. The difference in floor elevation is 8 in. in 40 ft.

We were fortunate that the Crane Co. had an able heating engineer to design our radiant heating system for us. His design was checked by the A. M. Byers Co., who furnished us the wrought iron pipe. The design called for two separate circulatory systems, one for the repair shop, parts room and office area, and the other for the large storage area. We wanted to keep the first area at a temperature between 65° and 70°, and the latter at about 60°. Each separate circuit has its own thermostat and circulating pump and operates independently. We changed our mind about a stoker fired boiler and installed an oil fired boiler. The coal bin, which we constructed with the foundations, holds two 3000 gal. tanks, so connected that they automatically feed when the thermostats kick the burner into operation. This heating system operated for us last winter in an excellent manner, and is ideal, as far as we can see, for our needs.

During the summer of 1947, each of the two circulation systems was assembled, fitted and welded, using gas welding. Each connection was doubly welded, and when the circuit was complete, it was filled with water and tested under a pressure of 150 lbs. per sq. ft. Very few leaks were found. They were carefully welded, after the water was released, and a re-test was made. After the tests were completed we poured a 6 in. concrete floor around the pipe. Relief and shut-off valves were encased in cast iron boxes. We had previously made small concrete blocks about 2 in. square and  $\frac{3}{4}$  in. thick, which we placed under the pipe, to be sure that the pipes were elevated and that the concrete could be worked all around them.

We placed a  $\frac{3}{4}$  in. thick fibrous expansion joint material all the way around each room between the foundation and the concrete floor. In the smaller rooms we poured the concrete in 15 ft. squares without expansion material, except at the walls. In the large storage room, we poured the floor in 12 ft. x 20 ft. sections, but used  $\frac{3}{4}$  in. expansion joint material, extending from the outer walls towards the center of the building, giving us an expansion joint across the building at 12 ft. intervals, and a floor slab of 12 ft. x 40 ft. with a construction joint in the center. We gave the floor a lightly swept finish, by lightly drawing a wet white wash brush over the surface after it was almost set. Before the floor was used,

we gave it a thorough treatment of liquid floor hardener, according to the directions which came with the product that we used, and we have a good solid floor that does not dust away.

We have a 2-in. water line and three 50-ft. sections of fire hose, with fog nozzles, on wall reels, so placed that we can cover each square foot of floor space should fire occur. We also have three  $1\frac{1}{2}$  qt. carbon-tet fire guns; one  $2\frac{1}{2}$ -gal. Foamex Extinguisher; and four 15-lb. Carbon Dioxide Extinguishers, all placed as suggested by experienced fire fighters. This equipment cost us approximately \$500. We hope we never need any of it, but if we do, it is on the job.

The accompanying illustrations show what we have accomplished. It may not suit everybody; there may be some mistakes in our solution; but we were able to eliminate some mistakes that would have gone into the building, if we had not sought the advice of other County Engineers and garage men. Two other Counties have paid us the compliment of asking for a set of plans and many have complimented us on our new building.

We have put \$70,000 into our plant. This includes the cost of the site, and everything on it, as well as the new garage building, and all of the equipment which we have put into it, such as the twin-post hydraulic hoist, new work bench equipment, storage bins, etc.

Since we have a heavy investment in our garage, we plan to have some one there all of the time. We have a man who comes on duty at 4:00 P.M., which is quitting time for the regular crew. He cleans the windshields, checks lights and batteries, checks the gasoline and oil in each truck, greases the trucks, and checks for needed repairs. He has everything ready for the next morning. That saves us time. He is relieved at midnight by a man who does the cleaning in the garage when there is no one around to bother him.

The satisfaction of having all of our equipment at one site, with the attendant saving of time, has made an improvement in our work. Having a nice place to work has improved the attitude of the men. Having a good place to store and overhaul and paint our equipment has helped too. The mechanic is no longer on his back on a cold drafty floor. The radiant floor keeps the trucks warm. They start easily. Even if they are brought in at night covered with snow and ice, in thirty minutes they are clear of all that and the floor is nearly dry. It is so much better than we had, that it seems like a Maintenance Man's Heaven.

# STUDIES FOR AN EARTHFILL DAM

M. J. SHELTON

General Manager and Chief Engineer, La Mesa, Lemon Grove  
and Spring Valley Irrigation District

THE La Mesa, Lemon Grove and Spring Valley Irrigation District, which serves several communities lying easterly of the city of San Diego, Calif., plans to construct the Chet Harritt earthfill dam in Quail Canyon. The District started reconnaissance and preliminary investigation early in 1947 and has continued engineering studies involving complete surveys, test pits, bank excavations, and core drilling.

The San Diego Testing Laboratory, with Phillip W. Helsley in charge, made a complete soil study of the availability and suitability of materials for the dam. Nearly 300 test pits were sunk, using either a bulldozer or a back-hoe, and an actual test area was set up where bank excavation was loaded into trucks, hauled to the test area, spread with bulldozers and compacted with sheep's foot rollers, under controlled moisture conditions. The study showed there are sufficient materials of each classification within the reservoir site for the construction of the dam.

Baylor Brooks, Professor of Ge-

ology of San Diego State College, was employed by the District to make a geological study of the damsite and reservoir area. In connection with this study, the District has had eight diamond core holes drilled to an approximate depth of 100 feet each. These core holes definitely indicate a very satisfactory damsite formation. The geological report has been submitted to the State Engineer.

Carl R. Rankin, Consulting Civil Engineer, prepared the plans and specifications for the project and for submission to the State Engineer. The District had previously prepared preliminary plans which had been reviewed by the State Engineer and these formed the basis of the work of Mr. Rankin. The proposed earthfill dam will have a height of 175 feet, a crest length of 1146 feet, and a freeboard of 7 feet. The construction will involve nearly 1,500,000 cubic yards of fill. The reservoir will have a surface area of approximately 181 acres and a storage capacity of about 10,500 acre feet. There will be a paved 14-foot roadway on top of the

dam. The spillway will be of concrete and both slopes of the dam will be rock-faced. A tunnel, approximately 700 feet long, will be built for the installation of the supply and blow-off lines. This tunnel will extend from the downstream toe of the dam to the intake tower, which will be of concrete construction.

A preliminary draft of the plans and specifications has been submitted to the State Engineer's office for review. Later, the completed contract documents will be submitted for formal approval. It then will be necessary to have the California District Securities Commission review the project, particularly as regards the financing program. Upon final approval, the necessary bond issue will be submitted to the voters; and if approved, the District then will call for bids. It is expected that the work, which will require 18 months for completion, may possibly get under way in the first half of 1949. The amount of the bond issue will probably be between \$2,000,000 and \$2,250,000. This will finance the construction of the dam as well as the following pipelines:

5500 feet of 42-inch pipeline across the reservoir site, replacing an existing 42-inch redwood main; 7000 feet of concrete pipeline from the outlet tower to the District's El Monte pumping plant; 3 miles of cast iron pipeline within the service area of the District, starting with 20-inch pipe and gradually reducing to 12-inch pipe. This line will provide a feeder main around a very rapidly developing area and will permit service to that area from two or three sources whereas there is now but one source.

The Chet Harritt reservoir has a drainage area of only 1.7 square miles. The reservoir is not intended for catching surface runoff, but rather as terminal storage for water from three different sources. The primary source will be the District's share of Colorado River water, delivered by the San Diego County Water Authority. The secondary source will be from the District's Cuyamaca Lake where losses from evaporation are approximately five times that expected at the Chet Harritt Reservoir. The third source will be from El Capitan Dam at such times as the San Diego River is in flood stage and water spills at El Capitan Dam.



The white line shows the crest of the proposed dam. Test and sample pits are shown at right.



# Pennsylvania's Clean Streams

**T**HE program for stream pollution abatement in Pennsylvania has brought this state recognition for setting the pace on a job now accepted on a national scale as vital for the preservation of the well-being and economy of the country. This position has been attained under the leadership of Governor James H. Duff, who is an ardent conservationist. The present anti-pollution program was inaugurated by the Sanitary Water Board, an agency within the State Department of Health, in 1944. Governor Duff was then the State Attorney General and he spearheaded the passage of the Clean Streams law through the subsequent legislature.

As the first step in applying the law, the Bureau of Sanitary Engineering, Department of Health, which is executing the program, made an appraisal of the streams of the State and placed them in three general classes: (1) those unpolluted from artificial sources; (2) those polluted by sewage and industrial wastes; and (3) those which were acid, particularly resulting from the mining and processing of coal.

For the purpose of explaining its purposes and aims under the program, the Sanitary Water Board later conducted public hearings in 10 different areas of the State. To these hearings were invited municipal officials, industrialists, stream

**J. C. GRAUL**  
Public Relations, Sanitary Water Board  
Pennsylvania Department of Health

conservationists, engineers, chemists, and—the average citizen. After consideration of the material produced at the hearings the Board officially adopted the proposed program.

The first step was the issuance of notices to municipalities and industries requiring the preparation of plans for treatment works and their submission to the Board for approval. The degree of treatment required was specified in each case. Up to the present time more than 600 municipalities and approximately a similar number of industries have received such notices. In addition, more than 220 applications have been received from anthracite collieries for approval of plans for treatment plants to abate the discharge of silt to the waterways in compliance with orders of the Board. Drainage of acid mine water to the streams, however, is in general exempted from the provisions of the Clean Streams law until a practicable method can be found for its treatment.

Some modification of this exemption was made in the law passed by the 1945 legislature which strengthened the Board's general program as related to industrial wastes. That law rules out the discharge of acid

mine waters to presently "clean waters" which are being devoted to public use. The Department of Health is authorized to divert acid mine water from the watersheds of clean streams to a point of discharge into streams already contaminated.

## Appropriation of Funds

To carry out what is looked upon as one of the most complex and far-reaching sanitation programs in history, the Legislature appropriated funds to the State Department of Health, specifying four items for which the money shall be spent. These are (1) \$4,250,000 for State aid in the preparation of plans; (2) \$500,000 for mine sealing (this work was transferred by the last Legislature to the Department of Mines); (3) \$1,700,000 for acid mine water diversion and silt control; and (4) \$175,000 for research. The money for State aid is an outright grant to municipalities or municipal authorities for the preparation of plans for sewage treatment works, intercepting sewers, pumping stations and other necessary appurtenances. The grant, however, must not exceed 50 percent of the cost based upon 1942 cost of construction.

Although a large part of the clean-up program necessarily has to do with the planning stage—municipalities and industries being required to submit plans for treatment



Left: 180-ft. diameter clarifier for coal waste treatment at Coaldale.

Below: Typical silt pond at anthracite colliery.



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Right: froth

Below:



# Stream Program

works—the outstanding accomplishments up to this time assure that many of the streams of this State will be restored to a condition which will make them safe for public use. In addition to the expenditures by municipalities and industry the State is spending some 35 million dollars in bringing reality to this tremendous pioneer venture which is being watched with interest by sanitation engineers over the world.

## Cleaning Up the Schuylkill

There are innumerable instances where pollution abatement has already been accomplished. The clean-up job on the Schuylkill River stands out as an accomplishment brought about in far less time than even the most optimistic thought would be possible. Along the banks of this strategic waterway are located almost one-third of the State's 10,500,000 population. It serves as a public water supply for the communities along its course, including the city of Philadelphia. For many years the river and its tributaries have been the carriers of an estimated two million tons of silt and small-size coal from the anthracite breakers. In the Philadelphia area, dredging operations must be carried on to keep open the shipping channels, and treatment of the water for public use is made difficult and expensive.

Under orders of the Board each

of the 47 breakers located along the river and its tributaries have installed pollution abatement systems. The larger companies have installed systems to reclaim the fine sizes of coal which formerly went to the streams. Other operators are recovering the smaller sizes of coal in the breakers. In all cases the silt goes to ponds where it settles out of the water, which after a given period of time enters the stream as clear effluent. An interesting phase of silt abatement is the ready sale the coal companies found for the fine sizes of coal, realizing a financial return upon their former waste products. The silt and fine sizes of coal which had accumulated over many years are being dredged from the river by the State Department of Forests and Waters. Pollution from silt having been abated, the Board is now issuing orders to the municipalities along the river to construct sewage treatment works.

## Allegheny County Sanitary Authority

Of tremendous importance in the clean-up of heavily used waterways in the Western part of the State is the project of the Allegheny County Sanitary Authority. This area, because of the topography, presents one of the most difficult engineering undertakings of its kind in the country. The Authority includes more than



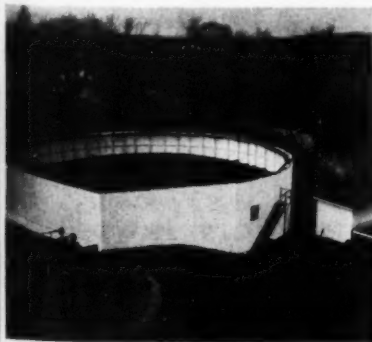
A poster used in Pennsylvania's campaign.

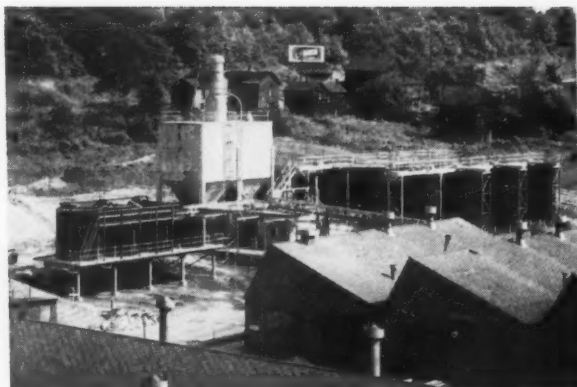
100 communities in the Allegheny County area in addition to Pittsburgh. Many industries have also joined for the disposal of their wastes. Sampling measurements and surveys show that the discharge of sewage into the waterways from the area covered by the Authority exceeds 200 mgd. Preliminary surveys, plans, tests and reports have been made for a sewage and industrial waste treatment system, which it is estimated will entail an expenditure of 82 million dollars.

Philadelphia has developed a sixty-million dollar program under which sewage treatment will be provided for the entire city. The Northeast treatment works, which will replace the present inadequate plant, is now

Right: Fine screen coal reclaimed by froth filtration at Nanticoke colliery.

Below: Carnation Co. milk waste treatment plant.





*Talon, Inc., waste treatment plant.*



*Clarifier for gas scrubber water at Shenango.*

under construction at a cost of about 11 million dollars. It is expected that it will be placed in operation this year. Other contracts have been let entailing the construction of interceptors and sewer extensions preparatory to the construction of the Southwest and Southeast plants.

#### **Industrial Waste Treatment Standards**

A number of industries have been treating their wastes to some extent over a number of years but many of these are now being required to increase the efficiency and the degree of treatment. In this category are steel mills, distilleries and oil refineries. All tanneries having their own waste treatment system must provide degrees of treatment which come up to the requirements of the Board.

It was determined that advancement of the Clean Streams program could be greatly facilitated by setting up waste treatment standards on an industry-wide basis so that where the wastes were of the same character, the same principles of treatment could be applied. This was done for the milk industry, the standards adopted by the Board having been arranged through conferences of the Bureau of Engineering and a committee of that industry. The same course is now being followed by representatives of the steel industry for the treatment of pickling liquors used in steel manufacture and by representatives of oil producers for the treatment of wastes at oil wells.

In an effort to determine if it is practical to supplement the present method of measuring the quality of water in streams, the Board arranged with the Academy of Natural Sciences of Philadelphia to conduct an experimental survey based upon the ability of waterways to support certain forms of biological life which can exist under varying degrees of pollution. By correlating the groups

of organisms present in waters to the various conditions of pollution, it is believed it may be possible, by sampling the waters for types of life which are present, to learn to what extent wastes discharged to the stream are causing damaging pollution. This project, the first to be conducted in great detail anywhere, is now under way on the Conestoga Creek in Lancaster County.

If this method proves practical, it is expected that it will be used to supplement the present methods based largely on the determination of the available oxygen in a stream.

Under a contract executed and approved by Governor Duff, a comprehensive study of the pollution of the Clarion River, which flows through a highly potential recreational area including the famous Cooks Forest, is being made by Camp, Dresser & McKee, consulting engineers of Boston, Mass. The study will include the amounts and kinds of polluting wastes being discharged into the river by a paper mill, and a determination of the maximum extent to which the pollution can be reduced.

Treatment of acid mine waters is one of the hurdles yet to be taken in the Clean Streams program since there is no known practical method for the neutralization of these wastes. Under a fellowship established by the Board, Mellon Institute of Pittsburgh is conducting a research program on the effect of acid mine waters on sewage and on methods for their treatment. Extensive survey work is being done in the Southwestern section of the state on acid mine waters diversion. If the stream to which mine drainage discharge might be made is of sufficient importance, the Board may provide a diversion system at State expense.

#### **Public Relations Program**

Public support of the program is looked upon as vital for complete success. In addition to news and special

releases a bulletin is issued quarterly. This was inaugurated about a year and a half ago, and has now reached a distribution of more than 80,000 copies. Twice yearly a series of colored posters is issued. These have been widely used for posting in strategic places, including industrial plants, schools and other public places. Small reproductions are made of the posters for use as mailing pieces. Nearly two million of those reproductions have been distributed. Up to this time over one half million each of two folders have been produced for general distribution. A 64-page book containing text, graphs and photographs is now being prepared which will cover the entire program and the necessity for its promotion.

Ninety percent of the population of this State procures its water supply from the streams. Over the years some waterways have been turned into conveyors of filth and many times are referred to as vile sewers. Governor Duff has accepted the challenge that it is the right of the people to have clean water to protect public health, and to permit recreational uses, and that those rights cannot be longer ignored. From an economic point of view he also declares it is an absolute necessity that the streams be restored to a clean condition. Industry has a stake in this equal to that of the public, for polluted water makes certain industrial operations difficult and expensive, and in some cases impossible. There can be no prosperity without a prospering industry. Industry cannot be attracted to Pennsylvania if water is not available nor if the available supply is largely the dregs of sewage and other wastes. This applies, too, to the half billion dollar annual recreation business in this State, and is of importance for fishing. Clean waters are therefore vital to our well being and under the pollution abatement program will become a reality.

# Basing Highway Design on Vehicle Performance and Highway Capacity

ONE of the important duties of the highway designer is to plan gradients, curvature, and sight distance so that traffic will flow safely and efficiently. For many years, there has been criticism of heavy trucks going so slowly up-grade that long queues of passenger cars are formed behind them, and then going so fast on the down grade that no one can pass. Such occurrences are general throughout the country on two-lane roads, and there is justification for the complaints.

Efforts have been made to remedy this situation by laws requiring that the relation between engine power and load of trucks be such that some stated speed, commonly 20 miles per hour, can be maintained on a specified grade, usually 3, 4, or 5 percent.

The effect on the truck operator of setting a performance standard is indicated by the results of recent vehicle-performance studies reported by the Public Roads Administration. The data in this article are based on a review copy of the 1948 report of PRA. The studies show that a typical truck and semitrailer, fully loaded and with a gross weight of 40,000 pounds, can maintain a speed of 20 mph on grades of 3% and 13 mph.

on grades of 5%. To maintain a speed of 20 mph. on a 5% grade would require reducing the gross weight to 27,000 pounds or, in effect, reducing the pay load from about 12 tons to 6 tons. Such a reduction in pay load would greatly increase highway transportation costs and the passenger-car driver would still complain about truck speeds of 20 mph.

It is believed by the Public Roads Administration that a satisfactory solution can be found within the realm of highway design. Highway engineers have been attempting to speed up truck movement by grade reduction; but in many cases adherence to a low percentage of grade has necessitated the introduction of so many curves that the sight distance needed for passing on grades has been sacrificed. Results of vehicle-performance and highway-capacity studies have shown that it is not sufficient to consider the various elements of design such as gradient, curvature and sight distance independently, and that there is little value in the reduction of grades or flattening of curves, per se.

## A Specific Application

Although the results of the vehicle-performance and highway-capacity

studies have been widely used, an opportunity to test their application to this type of problem first presented itself during the past year upon completion through rough terrain of a new road with good alignment replacing an old road with poor alignment.

In length and effective rise and fall, there was little to choose between the new and old roads. Both were about 21 miles long, crossed the same two mountain ridges, and had approximately the same rise and fall. On each road, grades are as steep as 8%, and, on each, steep grades run a mile or more in length. The big difference between the two roads is in the percentage of the total length where passing is permissible. On the old road, 49.3% in one direction and 45.6% in the other, or nearly half the total length, was marked for no passing. On the new road only 12.2% of the length in one direction and 11.6% of the length in the other will not permit safe passing.

## Vehicle Speeds Increased

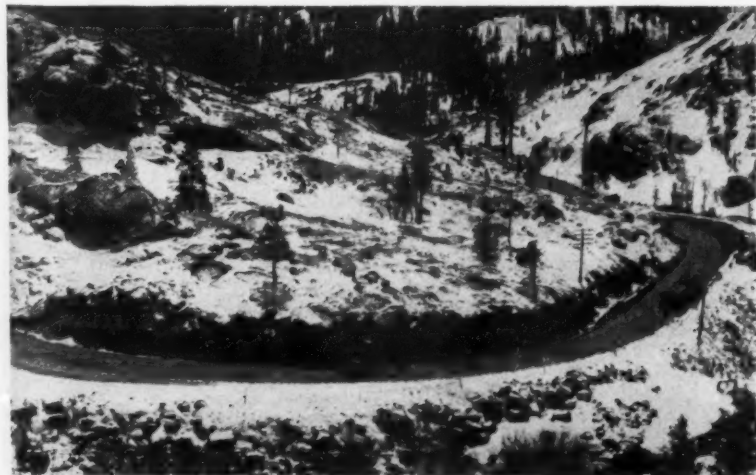
The average speeds of vehicles over the old and new roads, in miles per hour were studied, and show the following interesting results:

Typical 2-axle single unit trucks, with 150 to 200 pounds of gross weight per maximum horsepower, averaged 28.5 mph on the old road and 33.5 mph on the new road;

Typical combination units, with 300 to 350 pounds of gross weight per maximum horsepower, averaged 22.7 mph on the old road and 25.7 mph on the new road;

Passenger cars averaged 33.6 mph on the old road and 42.5 mph on the new road.

While the speed of trucks and combination units over the new and old roads are not widely different, there is a definite advantage in favor of the new road. Passenger car speeds demonstrate more clearly the important advantage of the new alignment. Average speeds have increased from 33.6 mph. to 42.5 mph., a saving of 8 minutes in average time. Speed observations made at



Courtesy Calif. Highways and Public Works

Sight distance on Donner Summit road above will be increased.



many points along each road indicate that the reduced travel time on the new road is not the result of excessive speed but results from reduction of delays caused by inability to pass slow-moving vehicles on grades.

These results should not be construed as an endorsement of the particular alignment or of 8% grades in general. It is possible that some other location would have provided equally good operating characteristics with lower grades. However, the

results do point to the fact that freedom of movement for passenger cars may be attained with steep grades if long sight distances are provided. The comprehensive and economical solution of the problem in some instances, at least, appears to be in a use of steeper grades and adequate sight distance, rather than in a reduction of grades with sacrifice of sight distance, or in adequate sight distance achieved with low gradient only at great cost.

## Snow Removal by Radiant Heat

C. M. ZIEGLER

State Highway Commissioner of Michigan

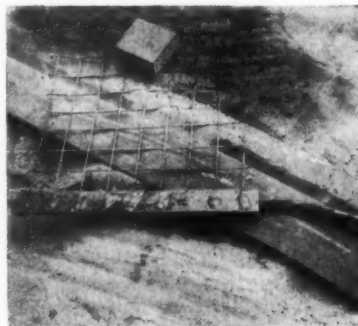
**R**ADIANT heat produced by electricity is being used to keep two sections of Highway M-102, at the west limits of Ferndale, Mich., free of ice and snow. This method of snow and ice control can be used 24 hours a day as a watchdog on expressway ramps and other strategic and heavily traveled locations on important highways to eliminate quickly snow and ice that might cause dangerous conditions if not removed immediately.

Cooperating with the Michigan State Highway Department in its first installation of electric radiant heat in road surfaces, is the Detroit Public Lighting Commission, which has furnished electrical data, wiring plans and equipment for the project. The Ferndale site was selected as an ideal location for engineers to study the effectiveness of radiant heat on two types of highway construction, under exactly the same weather and traffic conditions because it is located on a divided highway, with one roadway having a concrete surface and the other a bituminous resurface.

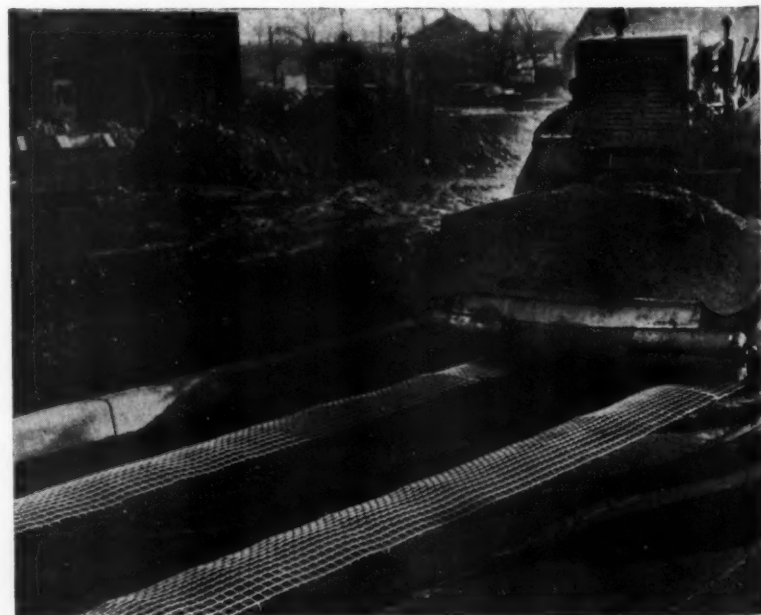
The heating elements have been installed in the roadway and operate on the same principle as the familiar electric toaster in the kitchen. These heating elements or grids, made by welding electrodes to the ends of 98-foot sections of standard 2-inch sidewalk reinforcing mesh, 18 inches wide, were embedded 1½ inches under the surface of the roadway. Two grids, one for each wheel track, produce sufficient heat for one lane of traffic. Each of the two 500-foot sections is equipped with heating elements installed in the outside, or passing lane.

Temperature of the pavement will be controlled by thermostats which automatically cut in and allow current to flow through the heating element when the roadway reaches the

freezing point. They will remain in an "on" position until the surface reaches approximately 35° F. The thermostat then will cut out, and re-



Element wires welded to crossbar.



The elements for radiant heating.

main out until the pavement temperature again drops below freezing, at which time they will again start the heating elements. Temperature control will be fully automatic. Experiments with a control, which will react to snow and sleet, are being carried on by one of the nation's leading manufacturers of automatic electrical devices. If fully perfected this control will be added to the installations in Ferndale, thus making winter maintenance of this highway fully automatic.

Electrical equipment for the 1000 feet of test section, controls, etc., cost about \$2,500. Large scale installation costs, however, would be much less expensive and should last for the life of the pavement, which is 20 to 25 years. Operating costs of the radiant heated highway will be surprisingly low. Under normal winter weather conditions, engineers estimate current will flow through the heating elements about 50 percent of the time. Designed to operate on approximately 50 watts per square foot of heating element, this entire project will draw 150 kilowatts per hour. With commercial electric rates at one cent per kilowatt hour, and the system using current only half of the time, operating cost for the 1000 feet of electrically heated highway will be only 75 cents per hour.

At no point in the heating element will the current exceed 65 volts. As the elements are under 1½" of pavement, a poor conductor of electricity, there is no danger of pedestrians getting an electric shock.

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# Savings Pay Cost of Salt Well for Softening Plant

DONALD D. HEFFELFINGER

Engineer-Superintendent, Department of Water and Sewage, Alliance, Ohio

THE first half of a comprehensive water department improvement program has recently been completed by Alliance, O. This project was started in 1945 and when completed the cost will total well over a million dollars. The Chester Engineers, of Pittsburgh, Penna., are consultants on these projects. Already completed and in service are over four miles of 10" to 14" water mains to strengthen the distribution system; construction of a 3 million gallon capacity welded steel distribution storage reservoir; a new high-service booster pumping station; and the remodeling of the existing filtration plant to include water softening. Projects remaining are the electrification of the present steam pumping station and the development of an entirely new source of supply to replace the heavily polluted Mahoning River which is now the main supply.

Alliance has a population of 31,000 and the daily water use is 6 million gallons, nearly half of this amount being used by the city's largest industries. Financing of the completed projects were arranged through a \$400,000 issue of general obligation bonds and \$100,000 water department surplus. The remaining projects will be financed through another bond issue in the near future. Considerable savings in operat-

ing cost will be obtained when the electrification program is completed in 1950.

The remodeling work on the filtration plant included revamping the existing mixing chambers and settling basins, and installing mechanical rapid-mixing and sludge removal equipment; construction of a new building for storing chemicals and housing the chemical feeding equipment and pumps; and conversion of four sand filters to zeolite softening units.

## Split Treatment Operation

The plant was designed for split treatment operation, approximately 75% of the raw water entering the mixing chamber. This is overtreated with lime to a caustic alkalinity of 50 ppm and pH 11.0, and after 30 minutes mixing and flocculation, is given four hours settling in the primary basin. The unstable and overtreated effluent from this basin is then mixed with the balance of the raw water, approximately 25%, which reduces all the alkalinity to the carbonate form, and is given an additional settling in the secondary basin. Provision is made to circulate both primary and secondary sludge to the influent end of either basin. Ferri-floc is used as a coagulant in the secondary basin to aid in settling the carbonate precipitate.

The lime softened water then enters the filter building where filtration takes place through 8 rapid sand filters, each with a capacity of 1 mgd. After filtration, approximately 40% of the filtered water is recirculated through four zeolite filter units which softens this portion of the water to zero hardness. This water is then blended with the lime softened water to produce a finished product of approximately 90 ppm. hardness.

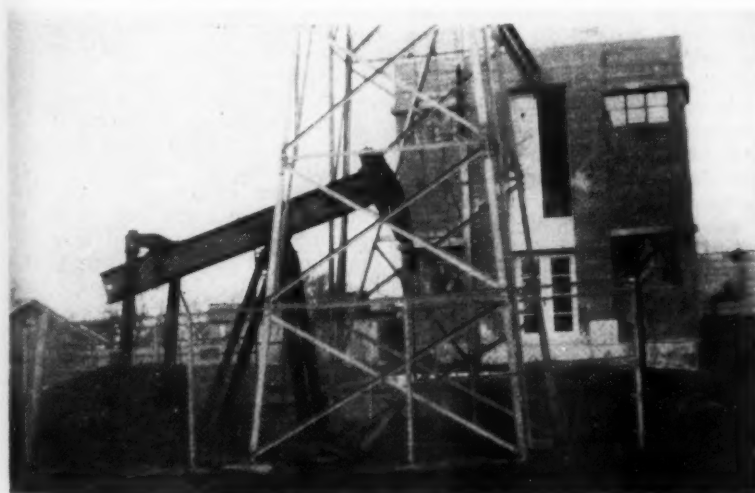
Since salt for regeneration is the major item of expense in the operation of zeolite filters, and since it was known that both rock salt and salt brines existed in various formations in Ohio, a detailed study was made of the possibility of drilling a well to obtain salt by this means from underground formations. If this proved feasible, considerable savings in operating costs would result.

## Getting Salt from a Well

Publications of the Geographical Survey of Ohio and of the United States Geological Survey were studied, logs of gas and oil wells in the vicinity were obtained, and local private well drillers were interviewed. All of these sources were in general agreement that there existed in the formations beneath Alliance both rock salt and salt brines.

Rock salt is found in the Salina formation which consists of a series of shales and dolomites between which layers of rock salt are interstratified. The Salina formation is 200 to 600 feet in thickness in Eastern Ohio but thins and finally disappears in Western Ohio. It is in this formation that the salt beds are found which furnish several large Ohio industries with the raw material for making salt, soda ash, chlorine and other chemicals. The thickness of the salt strata varies from 25 to 200 feet. This formation at Alliance is approximately 3800 feet below the surface.

Salt brines are the solution remnants of sea water that filled the interstices of the sands and silts deposited thousands of years ago and buried during succeeding centuries by hundreds of feet of other rock material. These brines in general



The brine pump set-up at the salt well.

compare with sea water in analysis although different brines vary considerably in chemical content, depending to some extent on the depth. The deeper brines show higher concentrations.

Information available indicated that sufficient brine with a salt concentration approximating 0.5 lb. per gallon could be obtained from the Berea formation which, at the site of the Alliance Water Works, would be about 600 feet deep. The Berea formation is also a producer of gas and oil. The Berea sand is widely distributed throughout Eastern Ohio, and consists of beds of fine stone separated by shale. Brines from the Berea were used in the early days of salt making in Ohio.

Since going to the depth required to obtain rock salt would be very costly, and since indications were that sufficient salt for our purpose could be obtained from brine, it was decided to drill into the Berea sand in an attempt to obtain salt. Accordingly the drilling of this well was included in the contract for the water softening plant.

#### Drilling the Well

The drilling was done by the J. L. Harper Co. of Cleveland, Ohio. Provision was made to collect gas, but although some gas was encountered it was not deemed sufficient to be worth while collecting. The Berea sand was encountered at a depth of 558 feet to 656 feet. A casing, 10 3/4" O.D., was set to a depth of 88 feet and 7" O.D. casing set for 464 feet. The brine rose in the well to within 90 feet of the surface. Preliminary test baling indicated a yield of 25 gallons per minute of a brine containing approximately one quarter of a pound of salt per gallon.

Some question arose as to the advisability of shooting the well with nitro-glycerin to increase the yield, but in view of the dangers involved, it was decided to postpone any shooting until at least after the yield had been more fully determined. A hole was drilled to a depth of 26 feet below the Berea sand and brine formation to form a pocket to collect any sand which might wash into the well.

A 40-foot derrick was erected over the hole. An "Oil Well" twin crank pumping unit similar to that used in the oil fields was installed, using 3/4" sucker rods. The drop pipe was 3 1/2" O.D. with a 3 1/4" x 10' working barrel.

After the well was put into operation a complete analysis of the brine was made showing 0.23 lbs. of sodium chloride per gallon, a total

hardness of 6,428 ppm, and an iron content of 32 ppm, but no barium or sulfates. Iron and barium had been anticipated and equipment designed and installed in the new chemical building for their removal.

#### Using the Brine

The brine is pumped to a coke tray aerator, measured through a Sparling meter and passed into a small baffled mixing chamber where lime is added proportionally to the flow by an American Water Softener feeder. The iron is precipitated in a small settling basin and the brine is then filtered through a miniature rapid sand filter 3' by 4' in size. A float valve maintains a constant head on the filter. A centrifugal pump delivers the brine from the brine storage well to the filtration building and the zeolite filters. A Sparling batch meter automatically regulates the amount desired for each filter regeneration.

Since the brine was only half as strong as anticipated and less than required, the well was in operation 24 hours a day delivering 36,500 gallons of brine each day or about 4 1/2 tons of salt on a dry basis. After two months of operation the well showed no reduction in the amount of brine and no change in the concentration, so it was decided to increase the speed of the pumping unit to its maximum rate. This was done by increasing the sheave on the motor. This resulted in an increase in brine production to nearly 50,000 gallons, or over six tons of salt on a dry basis daily. After one year's operation at this rate, the concentration still remains the same.

#### Savings Pay for Well

Savings resulting from this method of obtaining salt have more than paid for the cost of the well during the first year. Total cost of the well including derrick and pumping equipment amounted to \$9,368. No unusual operating difficulties have been experienced. The sucker rods have been pulled once to replace worn cup leathers in the working barrel.

The brine obtained is sufficient except at times when the river water hardness exceeds 230 to 250 ppm. At such times the brine from the well is supplemented by purchased salt which is fed by a dry feeder into the mixing chamber of the small brine treatment unit, increasing the brine strength to the required concentration. Purchased salt was used at times during three months this past year.

The Mahoning River normally has

a yearly average hardness of 200 ppm with a maximum during low flow periods of 300 ppm. This past year, more than average rainfall has kept the water somewhat softer. The average hardness has been reduced through the plant from 180 ppm to 84 ppm. Chemical costs have averaged \$9.67 per million gallons, of which lime cost was \$6.28, chlorine \$1.73, coagulants \$1.62 and purchased salt \$0.24.

#### Cost of Laying Water Pipe in Hartford

Breakdowns of pipe laying costs have been kept by the Hartford, Conn., Water Bureau for many years. Costs for 1947 are now available in the annual report for that year. On 4,092 ft. of 6" pipe, the cost per foot was \$3.409, compared to \$4.258 in 1946. There were 22,824 ft. of 8" pipe laid at an average cost of \$3.737 per ft., compared to \$3.244 in 1946. On 10" pipe, 1947 costs were \$4.051 on 3,693 ft., compared to \$4.387; and on 5,152 ft. of 16", the cost averaged \$7.684 per foot. Machine trenching costs were included in all cases.

#### Economical Imhoff Tank Construction

(Concluded from page 23)

rugated Transite also requires no special tools for application as it can be sawed, drilled and worked with wood working tools. And as an esthetic touch, the light cement grey color and uniform texture presents an attractive appearance.

#### Volume Savings

A smaller point, but important, when every cubic foot of designed space costs so much, is the comparison of "bonus" space due to the difference in thickness required for Transite walls: approximately 6" for concrete to 3/8" for Transite or almost a half cubic foot gained for every square foot of Transite used. Not only is space saved but weight of structures is also reduced from approximately 75 pounds per square foot of wall to 4.1 pounds per square foot.

An examination of the sketch of a typical Imhoff tank cross section will show the general arrangement of the use of corrugated Transite, slot gate, and sludge chamber division wall. Further information on the details of installation or construction of the plant is available and can be supplied.

## Consulting Engineers Plan Street Improvements

A town-wide paving program, using reinforced concrete, is under way for Berwick, La. Cost will be about \$280,000. T. F. Kramer, Franklin La., is consulting engineer and Lawton Construction Co., Lawton, Okla., will do the work. Lublin, McGoughy & Associates, Norfolk, Va., are the consulting engineers for the construction of that portion of Route 60 within the city of Norfolk. The contract was let in December. Cost will be about \$600,000. The same firm is in charge of work on Route 170, also in the city, which will cost about \$650,000. Bids will be called on this work in April.

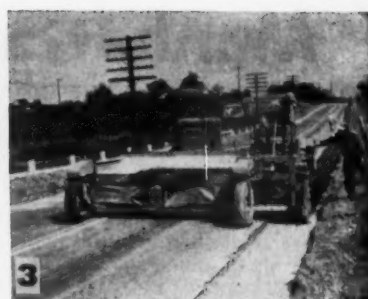
Asphalt paving in Griffing Park, Texas, totalling about \$400,000, has been designed by Charles P. Smith, Engineer, Port Arthur, Texas, and bids will be called for this month. Mr. Smith is also in charge of extensive drainage work in this area. Leslie Williams, New York City consultant on traffic, parking and city planning, is making traffic and parking studies for New Canaan, Conn. His report will recommend street changes and provisions of off-street parking.

## Non-Skidding Pavements

Discussing the subject of safety aspects of road surfaces before the National Safety Congress in London, Reginald A. Kidd, County Surveyor of Nottinghamshire, named skidding as a special danger. He referred to the fact that water acts as a lubricant to rubber, and said: "Produce an open texture road surface so that water can escape under the pressure of a tire and you will have gone far towards producing a non-skid road."

"The aim must be a degree of rugosity of surface providing maximum resistance to skidding but subject always to reasonable life of surface without treatment, and reasonable comfort to both driver and passengers. From the road user's point of view, a surface which remains rough and gives a sense of security is desired. From the highway engineer's point of view closeness of texture to withstand the action of the elements and traffic must also be introduced. The effect of traffic is generally progressive, closing up the surface and reducing anti-skid properties but with added life to the surface. On the other hand, a surface too close in initial construction, designed for long life only, may lack the properties which give security to the vehicle driver."

"In the case of semi-open tarred or



Steps in widening old Ohio road: 1 and 2 show placement of the crushed stone; 3 and 4 show how the hot mix was laid.

## An Efficient Road Widening Job in Ohio

A 4-ft. widening job, 2 ft. on either side, has just been completed for the State of Ohio by the Mansfield Asphalt Paving Co. of Mansfield on U. S. #30-S, just west of Mansfield. The widening consisted of (1) two 4-inch layers of crushed stone, 4-inch maximum size; and (2) one layer, 3 inches thick, of hot-mixed asphaltic concrete. Although a 2-ft. width was specified, the stone was

laid to a width of 30 ins. and the hot mix to a width of 27 ins.

The illustrations herewith show the general methods employed and the work in progress, using an Apsco widener for spreading the stone and asphalt. Only 30 minutes were required for changing over the equipment from asphalt to stone to begin laying the opposite strip after completing the first strip.

bituminous carpets, precautions suggested are firstly the selection of a proved material with well balanced proportions of fines and binder, a mixture of hard and soft varieties of stone in the aggregate where necessary to ensure that attrition will tend to retain textures, and the provision of a waterproof dressing immediately under the surface coat.

"On a three lane 30-ft. roadway in a country area carrying moderate arterial traffic, the action of traffic produces distinctly a concentration of wheel loads on the two side lanes, with attendant closing up of the surface, while the lightly traveled center lane suffers from the ravages of the

elements. So apparent has this been in Nottinghamshire that in connection with thin carpeting work a closer texture surface has been provided in the center lane. This is a practice which can be utilized to provide yet another safety measure, namely a contrast in colors between traffic lanes. Both by day and by night the relatively light center lane together with the relatively dark side lanes have produced some measure of increased safety factor."

Concerning concrete pavements, he said that passing a soft brush over a finished concrete surface produced an anti-skid coefficient 50% greater than that of the surface not so treated.



# Manhattan's Floating Underpass

MICHAEL KLEIN

Chief Engineer, President of the Borough of Manhattan

**T**HE Manhattan Plaza Connection, a huge culvert-like structure built on river mud, will serve as a link between New York City's West Side Elevated Highway and the Brooklyn-Battery Tunnel. This connection consists of two southbound lanes each approximately 11 feet wide taking traffic from Manhattan to Brooklyn. The purpose of this structure is to separate the tunnel traffic from the normal heavy street surface traffic moving to and from piers along West Street and Marginal Street.

The Manhattan Plaza Connection is an underpass lying within 100 feet of the present bulkhead line of the Hudson River and, as the original shore line used to be much farther east, is entirely through filled-in ground, river mud, riprap-filled cribs and old piers. It had to be massive enough to resist flotation as its bottom elevation is 23 feet below mean high tide.

A ship designed to float is constructed on ways and then launched into the water. This tunnel, however, designed to "almost float" on river mud, had to be constructed in its final location as it could not be launched and was too heavy to precast.

The tunnel's mass was such that, when finally constructed, there would be very little downward pressure, due to flotation. Nevertheless, it had to be supported during construction as all work had to be built "in the dry." By continuous pumping, the water level in the trench was kept below the bottom elevation of the structure. The subgrade consisted entirely of river

mud, and in order to support the tunnel during construction, untreated wooden piles were driven in a grid pattern 5 feet on centers in both directions.

## Handling Subsurface Problems

Before construction of the underpass could be started, it was necessary to relocate a maze of subsurface structures which serve the many skyscrapers located in lower Manhattan. Sewers, water mains (both low and high pressure), pneumatic mail tubes, telephone, telegraph, fire alarm and electric lines, gas and steam mains, in fact every type of subsurface structure except a subway had to be moved.

The first step of the actual construction was the driving of H-beams as "soldiers" on 8-ft. centers, 3 ft. beyond the outside lines of the tunnel to about 10 ft. below subgrade to support the horizontal 3" x 10" timber sheeting. As the depth of excavation progressed, these timbers were placed one beneath the other with a gap of 2" between each. The purpose of this gap was to prevent hydrostatic pressures building up behind the sheeting. Also, as the depth increased below high-water level, the rate of pumping increased until finally when the cut was fully excavated, one 10" pump operating continually, supplemented by another 10" pump at high tide, was necessary to keep the cut dry.

Open tile drains 6" in diameter were placed about 12" below the subgrade along the outer edges of the excavation to channel the inflow to the temporary sumps. The location of

these sumps was changed as the digging progressed and they were usually placed where the greatest inflow occurred. The final temporary sump was at the low point of the tunnel.

Several bad leaks were encountered where old piers were exposed. These old piers were essentially riprap filled cribs at right angles to the bulkhead line and acted as open drains to conduct the Hudson River into the excavation. These leaks were sealed by jetting sand, cinders, and some grout into the riprap behind the sheeting.

## Construction Procedures

The piles were then driven and a 6" layer of broken stone was placed. The purpose of this broken stone was two-fold; first, to afford a drain so that the lateral pressures, varying with the fluctuations of the tides, would be equal on both sides of the structure; second, to provide a dry surface for the 9" protection concrete slab on which the base waterproofing was placed. This base waterproofing consisted of one ply of fabric and asphalt and two layers of brick and mastic.

The reinforced-concrete base slab, approximately 2'6" in depth, the side-walls, and lastly the roof or ceiling, were each separate pours, with construction joints spaced about 40 ft. apart.

The roof slab with its glazed ceramic tile ceiling designed to be cast with the concrete presented some unusual problems. The tiles were 4 1/4" square by 5/16" thick with dovetail "buttons" on the back to anchor them to the roof slab. As designed, they were to be stuck to glued paper on the



Sub-drains for the tunnel approach.



Side wall bracing methods.



plywood roof forms and the heavy 2½-ft. slab, reinforced with 1½" round rods, poured on top of them. The problems were how to protect the tiles from damage while the rods were being set and then to be sure they were not displaced as the heavy mass of concrete was dumped on top and vibrated.

#### Placing the Tile Ceiling

These problems were overcome by setting the tiles on the glued paper which was tacked on the forms, filling the joints with sand, and pouring a bed of mortar on them 1" thick. Into this mortar were set sheets of #12 gauge steel welded wire mesh in 2" x 2" squares, formed in rectangular corrugations 2" vertically and 2" horizontally. The tiles were thus protected from damage and displacement and the wire mesh, projecting 1" above the mortar, was a strong anchor to the roof slab which was poured a few days later. After the forms were removed and the glued paper stripped off, the sand dropped out of the joints which were then pointed with neat cement.

The sidewalls and roof were waterproofed with 5 plies of impregnated cotton fabric and asphalt moppings. The waterproofing on the sides was protected by walls of 4" precast concrete blocks and the roof by a 3" concrete slab.

As the waterproofing and protection walls were set, backfill was placed, puddled and tamped between the sheeting and the completed structure, and the pumps were gradually slowed down.

The interior sidewall finish of 16" x 16" x 2½" thick glazed hollow tiles was set so that a ½" clear space remained between the back of the tiles and the concrete walls to act as a vertical drain for any condensation or slight percolation which might occur. These spaces were connected to slots at the back of the sidewalks and the



Preview of course of Manhattan's underpass.

slots, in turn, were piped to the roadway inlets. This method of construction was employed to insure dry walls and pavements even though some future leaks might occur.

#### Other Construction Details

A 4" concrete pavement wearing surface, steel curbs and concrete sidewalks completed the interior of the underpass. Air-entrained cement was used in the concrete for both pavements and sidewalks for protection against salt erosion.

The north ramp walls were faced with 6-cut ashlar granite to conform with the architectural treatment of the West Side Highway and the south ramp walls were faced with random ashlar seam face granite of various colors to match the granite walls of the Brooklyn-Battery Tunnel.

The underpass is to be illuminated with two continuous lines of fluorescent tubing along the edges of the ceiling parallel to the tunnel walls which should provide a uniform non-glare lighting as evidenced by the test section now in operation in the Queens-Midtown Tunnel.

A large chamber on the west side of the structure beneath the street surface will house the ventilator fans and pumps for the permanent sump. The latter are provided to eject the rainwater which will drop onto the open ramps and flow down to the low point of the tunnel.

The ventilator fans of 70,000 cfm capacity each are designed to operate alternately whenever the CO Recorder automatically starts them. This CO Recorder will start and stop the fans as the CO content varies in the tunnel. The fans will discharge the foul air through ducts to an open grating area. Fresh air will be sucked in from the open ramps at the end of the underpass.

Another unusual feature of this structure was the design of the overhead ramp leading from the West Side Highway to discharge local traffic. The loads of the columns of this ramp were transferred to the base slab of the underpass rather than on to individual footings. This simplified the waterproofing of the underpass and resulted in a considerable saving.

Repaving of the street surfaces with 3" sheet asphalt pavement, new steel curbs and concrete sidewalks, the placing of some park benches, trees and ornamental railings will complete the President of the Borough of Manhattan's part in the Plaza construction.

This Manhattan Plaza Connection underpass, rapidly approaching completion, has served in effect as a "pilot model" for the larger and longer Battery-Park Underpass, construction of which will soon begin. The latter, though greater in scope, presents many of the same types of problems due to its similar location and it is believed that the lessons gained on the construction of the "pilot model" should greatly facilitate the full-scale edition under Battery Park.

The underpass was designed and construction supervised by the Engineering staff of Hugo E. Rogers, President of the Borough of Manhattan. Cayuga Construction Corp. of New York City was the General Contractor.



The tunnel looking north.

# Refuse Disposal in Holland and Switzerland

**HENRY W. TAYLOR**  
Consulting Engineer, N. Y.

**A**T THE Fourth International Conference on Public Cleansing, held at Amsterdam, Holland, in September 1947, papers were submitted by representatives from Holland, Switzerland, Belgium, France, Great Britain and America relating to street cleaning and refuse collection and disposal as practiced in these various countries. Since these reports are not widely distributed, a brief summary of two of the reports is appropriate. The scope of this article is confined to those features of incinerator design in Holland and Switzerland which apply to and are of interest to American practice.

In both of these countries incineration is not, as yet, the major method used for disposal of refuse. Both of these reports indicate a growing lack of suitable areas for dumping into old clay pits and quarries, for raising the level of swamps, tributaries to river estuaries, dry land dumping and controlled land fill. There are apparently few instances of controlled land fill as practiced in England and the United States.

## Switzerland

The report from Switzerland is entitled "The Collection and Disposal of Domestic Refuse in Switzerland" by Messrs. Als Bossard and Rud. Herman of Luzerne and Zurich respectively. This paper cites three modern incinerators which may be briefly described as follows:

The town of Davos is a health resort with a population of 15,000 people which installed an incinerator in 1914 with a capacity of about 40 tons per 24 hours. The necessity for incineration arose from the character of the town and the need for the special sanitary facilities required by a health resort and from the failure of other methods of disposal to fulfill these requirements. This plant is a steam raising plant, the steam being delivered to an adjacent gas works where it is used for power and

heating. The plant operates under temperatures ranging from 1700° to 2200° F. and the steam yield is 0.675 pounds of steam per pound of refuse. This steam production ratio indicates leanness of combustible materials and is more indicative of European conditions than American.

The city of Basle has a population of 17,000 and was confronted with a lack of suitable dumping ground. This plant was designed for a refuse capacity of 30,000 tons per year but allowed for the use of an equivalent tonnage of peat or low grade fuel to develop a secondary source of steam. Apparently the secondary fuel is not being used as yet. The produced steam is converted into power which is delivered to the Basle electric plant. The plant is of "Volund" type, which provides a series of 3 drying grates, an ignition grate and rotating kiln. The plant is of pit and crane design with submerged ash conveyor for removal of residue. Due to the gravity flow of refuse from one grate to another, the incinerator structure is necessarily high at the refuse pit and feeding area, and the drying chamber and

ignition furnaces are also of considerable vertical proportions. This incinerator as well as the Basle Electric Works are connected to district heating systems whose use of heat will increase as the consumers increase. In 1946 the refuse quantity amounted to about 25,000 tons. The plant is operated at temperatures from 1600° to 2000° F. The refuse pit bottom is rounded.

The incinerator plant at Zurich was originally built in 1904 but was reconstructed in 1927 under Heenan and Froude license. This incinerator generates steam for a dual purpose. The generated steam is delivered to the turbo-generators at a pressure of about 280 psi. Steam is bled from the turbine at the stage where the residual pressure is about 70 psi and delivered to a district steam distributing system (see accompanying cut of Zurich plant.) This steam distributing system includes the incinerator plant itself and auxiliary buildings, the railroad round-house, an apartment building containing 110 suites, the main railroad station at Zurich and its main post office building. If the steam delivered to the turbo-generators is in excess of that bled from an intermediate stage of the turbine, the remaining steam continues through the low pressure stages of the steam turbine to the condenser. If there were no demand in the district steam heating system, all the steam would continue through the various stages of the steam turbine and it would operate as a condensing turbine for all steam delivered to it.

(Please turn to page 42)



The Zurich incinerator is typical in appearance of many European installations.

# WHEELING LOOKS AHEAD

JAY E. HENRY

City Engineer, Wheeling, W. Va.

**U**NDER the guidance of the Wheeling Planning Commission, the city is looking ahead and planning for public improvements designed to improve industrial and transportation facilities, and, at the same time, to make available attractive home sites at reasonable costs. The Wheeling Planning Commission consists of 9 members and a secretary. The Commission members, serving without pay, have the following duties:

"To cause to be prepared maps, charts, and descriptive and explanatory material dealing with the future development of the City of Wheeling

and of any land outside the municipality which, in the opinion of the Commission, bears a relation to the planning of the city. The said material shall include among other things the present and possible future location, character, and extent of streets, bridges, parks, waterways, and other public ways, grounds, and spaces; the general location of public buildings, and public property; the general location of and extent of public utilities, whether publicly or privately owned; the possible removal, relocation, widening, extension, narrowing, vacation, abandonments or change of use of such existing or future public ways, grounds, spaces, buildings, property or utilities."

At the present time the following Wheeling citizens make up the

Wheeling Planning Commission: S. R. Morrow, Chairman, Production Manager, Bloch Bros. Tobacco Co.; W. W. Halloway, Chairman of the Board, Wheeling Steel Co.; A. W. Paull, President and General Manager, Wheeling Stamping Co.; Lee C. Paull, President, Lee C. Paull, Inc.; Austin V. Wood, Publisher, *Wheeling Intelligencer*, *Wheeling News-Register*; Sidney C. Smith, President, C. C. Smith's Sons, Engineers; R. V. Engstrom, Engstrom & Wynn, General Contractors; E. J. Runner, Owner, Griest Stores; Jacob Long, Representative, Trades and Labor; Jay E. Henry, Secretary, City Engineer and Director Public Works, City of Wheeling.

The city of Wheeling has a total area of 12.7 square miles or 8,180 acres within the corporation limits and an estimated population of 65,000 persons. Of this total about 2,330 acres are not suitable for future development of any type while 1,187 acres is occupied by the Ohio River and Wheeling Creek.

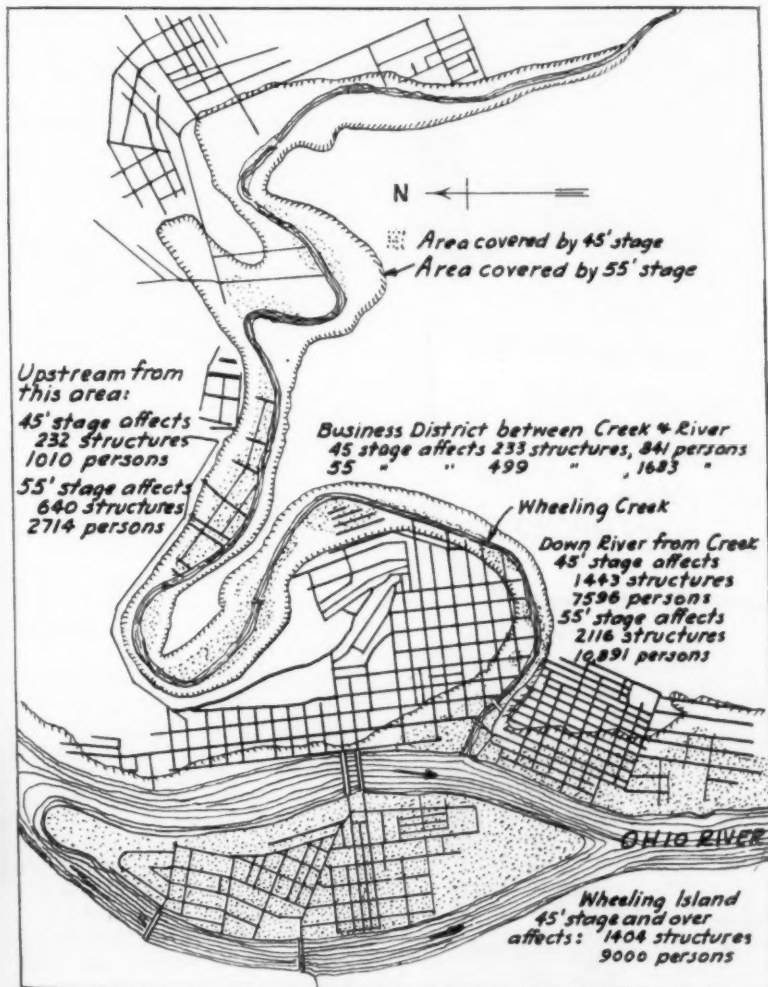
## Proposed Projects

Because of the physical conditions of the land, narrow streets, and threats of floods, the forward progress of Wheeling has been retarded. In order to overcome this difficulty the Wheeling Planning Commission has undertaken the projection of an overall plan which will when completed provide the city of Wheeling and adjacent areas the following:

1. **Combination Flood Wall and Express Highway** along the east bank of the Ohio River, beginning at the Narrows (South of town of McMechen) and extending north for about seven miles to 1st Street, Wheeling. This express highway will do much in relieving traffic congestion in the business area and at the same time should provide a large part of Wheeling with adequate flood protection.

In this connection the 1936 flood has been estimated to have caused about \$12,000,000 worth of damage to property, loss of payrolls, and the like, beside the forced abandonment of industrial plants and homes during the flood by approximately 16,000 persons.

2. **Peninsula cut and relocation of**



How Wheeling is affected by high water in the Ohio.



U. S. Route 40 calls for a cut through the peninsula and a change in Wheeling Creek. This will permit the relocation of U. S. Route 40, with a maximum grade of about  $3\frac{1}{2}\%$ . The present Route 40 on Wheeling Hill has grades ranging from 7% to  $11\frac{1}{2}\%$ . The relocation as planned will make available about 85 acres of flood-free industrial sites adjacent to the Pennsylvania Railway. The relocation of Route 40 to 16th Street will relieve present traffic congestion in the 10th Street area of the business district.

3. Relocation of Route 88, which

involves a cut of about 600 feet through rock, will, when completed, make available about 2500 acres of attractive hill top plateau for home sites. The Veterans' Bureau and other agencies have shown a keen interest in this particular proposal. The area made available is about 10 minutes car ride to the post office.

4. Wharf Parking Garage is a proposal for off-street parking adjacent to the business district. Plans call for storage facilities for about 600 cars. This should do much in the elimination of traffic congestion.

5. Completion of the Elm Grove

Boulevard calls for the construction of a bridge and approaches in Elm Grove, Wheeling. When completed the new road will provide an alternate for U. S. 40 and thus aid in reducing the number of cars passing through the business area.

6. High level interstate bridge at 29th Street is proposed to connect the new express highway with U. S. 40.

7. New bridge to Wheeling Island is proposed to replace the present two inadequate bridges, both of which have served long past their usefulness.

8. Rerouting of the Pennsylvania Railroad will make it possible for this railroad to connect to B. & O. facilities and thus provide the city with a Union terminal. The relocation of the tracks will provide room for the proposed flood wall along the Ohio River.

9. City-wide sanitary service program which will provide for the elimination of stream pollution in the Ohio River and Wheeling Creek, by the construction of interceptors and relief sewers and provide a treatment plant.

#### Planning Commission Accomplishments

Through the efforts of the Planning Commission and the 10th Ward Improvement Association, a public meeting was held by the District Engineer, Pittsburgh District, in Wheeling, February 12, 1948. This meeting was held for the purpose of determining the need for flood protection. At that meeting the Planning Commission, acting as spokesman for the City Council and other groups, presented data in connection with past flood damages sustained and the proposed plan.

Plans and specifications have been put together for the Wharf Parking Plaza. Until the final decision has been reached regarding the feasibility and location of the flood wall, further work on the parking plaza has been suspended.

The State Road Commission let contracts, and work has been started on the Elm Grove Bridge. The completion of this project will complete one phase of the overall plan.

Studies by the Ohio and W. Va. Road Commissions are under way on the 29th Street Bridge. The status of the bridge is dependent upon the status of the flood wall and highway and the relocation of Route 40.

Studies are also under way for the relocation of the Pennsylvania Railway as originally proposed or for the modification of the flood wall and highway plan to allow one track to

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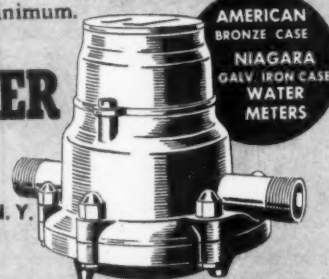


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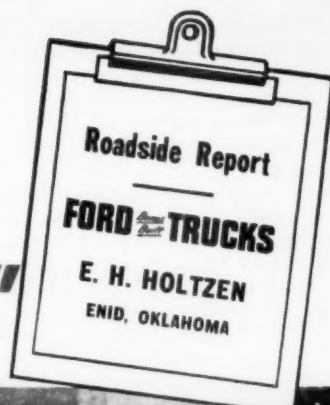
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- ★ Ford Super Quadrax 2-speed axle with vacuum shift for performance flexibility in Model F-8 (single speed axle also available); single-speed Quadrax Hypoid Axle in Model F-7.
- ★ Large diameter (10-inch) wheel bolt circle with 8 studs to allow for extra-strong hub construction.
- ★ Million Dollar Cab with Ford Exclusive Level Action suspension for greater driving comfort.
- ★ Nationwide service from over 6,400 Ford Dealers.
- ★ Ford Bonus Built construction for long truck life.

Gross Vehicle Weight Ratings: F-8 up to 21,500 lbs., F-7 up to 19,000 lbs. Gross combination ratings: F-8 up to 39,000 lbs., F-7 up to 35,000 lbs.

remain in place. A satisfactory solution is expected in the near future.

The City of Wheeling obtained an advance of \$125,500 from the Federal Works Agency for the purpose of making a preliminary report, designs, etc., on interceptors, relief sewers, and treatment plant facilities. Greeley and Hansen, consulting engineers, have completed the preliminary report and are at work on the designs for the interceptors. This project alone calls for \$5,300,000 of work if all sewers are constructed.

From the above, it is apparent that Wheeling is looking ahead. This is possible through the broad vision of the Planning Commission. The chairman, S. R. Morrow, has devoted much of his time to the work. Much credit is also due Mayor Carl G. Bachmann, members of the Council, and City Manager C. Hal Brues for their work.

### Foreign Refuse Disposal

(Continued from page 38)

In other words, electricity is generated by the total amount of steam by the high pressure stages of the turbine and by any remaining steam, after bleeding, in the low pressure

stages of the turbine. This electricity is delivered to the distributing system of the City of Zurich. The steam/refuse ratio at this plant is 1.0. The yearly production of electric power has been about 3.5 million kwh, about 1/3 of which is used at the plant itself.

The collection of dust in the refuse pit is accomplished by a rather novel means. The dumping truck automatically opens a refuse pit door and this door acts as a baffle to deflect dust downward and direct it to ports in the opposite refuse pit wall, these ports being the air intake for the furnaces.

Another outstanding feature of this plant is the use of a fixed control room for the operation of the 2 cranes, this control room being located in the center of the length of the refuse pit with windows down into the pit and across it. There are no cages on the cranes and the operators do not travel along it. The refuse pit bottom is rounded as in the case of Basle installation. Ash removal is accomplished by submerged ash conveyor.

### Holland

The City of Amsterdam, population 800,000, installed an incinerator in 1918 with a rated capacity of

1000 tons per 24 hours. This plant consists of eight units of 5 cells each, the cells having an area of 8.2 sq. feet each. The refuse is delivered to the incinerator by barge and the detachable truck bodies or "bins" containing 8.5 cu. yds. are lifted by monorail cranes to the storage bunkers. Refuse is preheated before delivery to the cells and this charging of cells is accomplished by a worm conveyor and is continuous unless interrupted by the stoker.

Steam is generated at about 200 psi and at a superheated temperature of 662° F. The steam/refuse ratio ranges from 1.06 to 1.66. The average yearly steam delivery to the power plant is about 187,000 tons, from which about 30,000 kwh are produced. On the basis of these figures, the turbine steam rate is about 13 pounds of steam per kwh.

Ash removal is accomplished by forcing a special pallet between the grate and the clinker and removing the clinker bodily in a solid cake. This mass is then quenched, ground, sieved and sold for road metal. In this operation, various scraper conveyors are used for conveyance of the material. The sale of iron, clinker and steam is reported to be \$76,-808.00. The price, credited for steam, is adjusted on a coal clause basis.

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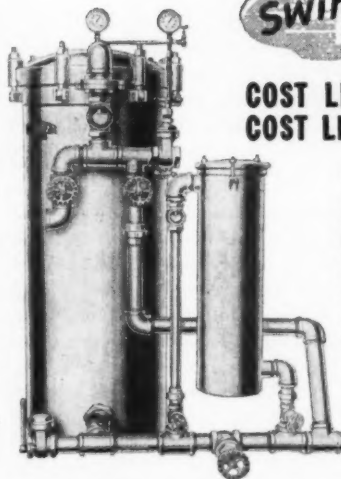
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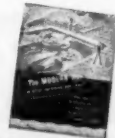
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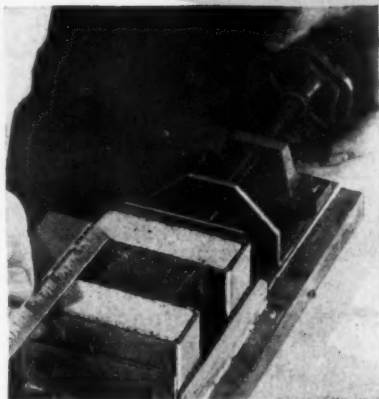
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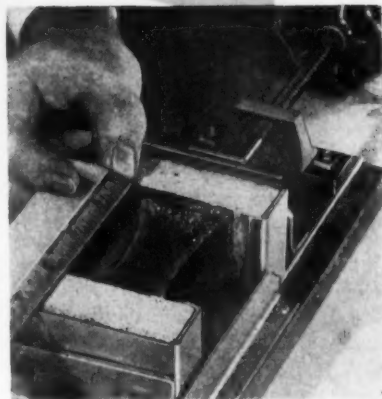
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The incinerator at Rotterdam is the oldest plant in Holland, dating back to 1912. The original plant has been improved from time to time but basically has operated successfully for thirty-six years. Steam is generated at this plant also.

The most modern plant in Holland is that at Dordrecht, a city with a population of 67,000 inhabitants. This incinerator was installed in 1938 by de Roll under Heenan and Froude license. No heat utilization is attempted at the plant, but clinker is sold. This plant is of the straight line design, the refuse pit being in line with the furnaces. The refuse is charged by a mono-rail crane and this same crane removes the residue, as is the case at Darien, Conn. The ash is discharged to a submerged conveyor which quenches and delivers it to an ash pit outside the plant building, from which it is lifted by bucket to trucks or storage. The mono-rail extends outside the building and is supported by cross members, steel trusses and piers. There are two units, each including three cells.

It will be noted that operating temperatures are high as compared with American practice. This may be

due to the desirability of such temperatures for producing superheated steam. Pit and bridge cranes, or pit and mono-rail cranes, are utilized in each installation and at one plant, the charging bucket is used for final ash removal. The submerged ash conveyor is largely used. The utilization of waste heat is incorporated in all plants except one. Automatic feeding devices are used in many of these plants to produce a measured charge at regular intervals. It is considered that the steam/refuse ratios are surprisingly high for a lean refuse in European countries.

The writer is indebted for supplementary information to W. A. G. Weststrate, chief engineer, of the Amsterdam Street Cleansing Department; to the de Roll Company of Zurich, Switzerland; and Heenan and Froude of Worcester, England.

### Performance Standards for Sewage Filters

At a time when there seems to be every prospect of considerable advances being made in the country in the basis for design of sewage filters, it may not be inappropriate to survey the standards in force in

the United States, to see whether they afford any indication of a universal basis on which to build. According to information given in the July issue of the journal *Public Works*, there are in existence three principal methods of indicating loadings. The first is by the amount of B.O.D. to be dealt with, usually measured in so many pounds to the acre-foot of filter medium. The second is by volume in gallons per acre-foot, and the third, by so many persons per acre-foot. The article refers to small plants, but in any event only the first of the figures mentioned can be said to be equivalent to our own present method of computation, on the gallons per cubic yard basis, with an allowance based on an actual figure of "strength," or approximate allowances for "strong," "medium" or "weak" sewages. Neither the second nor third method above takes into account variations in strength, although it is significant that the daily dry-weather flow figures are in the region of 100 gallons per head as against the considerably lower figures which would prevail here.

In contrast, the loadings given in gallons per acre-foot are equivalent

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to from 120-240 gallons per cubic yard, and are thus considerably higher than would be allowed on British standards. Only the first basis, pounds of B.O.D., seems to suggest an improvement on our own standards, and then only by virtue of its possibilities for wide application as a measure of the performance not only of filters, but of all units constituting a treatment works. The variations in requirements referred to above are altogether too wide to meet the more arduous conditions imposed in sewage treatment in this country, and it therefore behooves us to improve as far as possible on standards, which have remained unchanged now for a considerable period, and to lead the way in establishing an exact and more appropriate basis, if possible, capable of universal adoption, or, at any rate, offering a means for comparison of performance with installations in the United States, or elsewhere.

—Municipal Engineering, England

### Slow Sand Filter Operation at Hartford

Slow sand filters are used by the Water Department of Hartford, Conn. There are 14 beds with a total

filtering area of about  $7\frac{1}{2}$  acres. The average rate of filtration per day was 4.45 mg per acre, but maximum rates occurred as high as 6.6 mgad for limited periods. The maximum day rate was 4.98 mgad.; the maximum 7-day period rate was 4.49 mgad; and the maximum month rate was 4.87 mgad. Raw water color was reduced 56%, from 16 to 7 ppm. and bacteria from 275 to 1. Each filter was harrowed an average of 6 times during 1947: there were 23 washings and 3 resandings of the 14 filters. The cost of filtering and chlorinating was \$6.75 per mg. Of the total cost of \$73,387.37, the cost of chlorination amounted to only \$8,512.35.

### Chlorine Residual Recorder Experiences at Plattsburg

A chlorine residual recorder manufactured by Wallace & Tiernan Co., Inc., was installed at the filtration plant of the City of Plattsburg, N. Y., in August 1948. This was one of 14 similar installations of this new equipment throughout the country.

Because of the clarity of the raw water of the Plattsburg supply, ex-

perience has shown that heavy chlorination coagulates iron and other ingredients in the water so that flocculation may be secured at most times without the use of alum. About 7.0 ppm. of chlorine is required for this purpose. The dose is adjusted so as to maintain 3.0 ppm. free residual chlorine in the filter effluent. This does not produce chlorinous tastes in the delivered water.

The use of this automatic equipment has indicated at Plattsburg that the chlorine demand of most water supplies fluctuates to a larger extent than usually is realized. The record of fluctuating concentrations of residual chlorine has been shown to furnish secondary information as to conditions prevailing at filtration plants not associated ordinarily with chlorination. The indications are that the development of this equipment represents an important advance in water chlorination control. The next step would be to use the equipment to adjust automatically chlorinators so as to maintain a constant concentration of residual chlorine irrespective of fluctuations in the chlorine demand of the water.

The Plattsburg installation is under the supervision of Frank Behan, Chief Filtration Plant Operator. *New York State Water Works News.*

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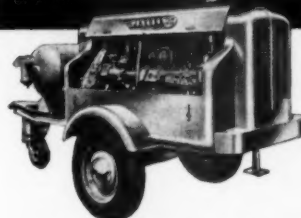
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# Planning Highways for Washington

**T**HE results and conclusions of an engineering study have been presented by C. Donald Kennedy, consultant, to the Washington State Legislative Joint Fact-Finding Committee on Highways, Streets and Bridges. This study points out that 52% of the state's roads and streets require improvement, and that one-third of the deficiencies should be corrected at once. Nearly 3,000 bridges are deficient. A 15-year program of construction, involving an annual expenditure of more than \$76,000,000, is recommended. An annual expenditure of about \$42,000,000 is needed for state highways, \$22,000,000 for county roads and \$12,000,000 for city streets.

The mileage of roads and streets in the state is now estimated at 57,216. Of this, 6,052 are in the state highway system; 39,821 miles are in the various county road systems; there are 6,583 miles of city streets; and 4,780 miles of Forest Development, Indian Reservation and National Park Roads. Of the city streets, about 55% have dustless surfaces, and 25% are gravel or stone. It is of interest to note that 156 cities under 1,500 population have but 815 miles of streets; 51 cities in the 1,500-5,000 population range have 739 miles of streets; and the 28 cities of over 5,000 population have 5,029 miles.

Highway pavements, like all other materials, wear out. The average life of asphaltic concrete or cement concrete, the high types of pavements used in Washington, are estimated at 20 years. Of the pavement listed as deficient, 36% has been in use more than 20 years. The average life of low-type pavement, ranging from single bituminous penetration surface treatment to a bituminous mat less than 3" thick is probably 5 to 10 years, and on this basis more than half of the low-type pavement found to be deficient is average.

## Highway Capacity Factors

The capacity of a two-lane rural road is reached when congestion and delays occur. A study of two-lane roads in Washington which are below adequate standards indicates that

their operating capacity is approximately 4,000 vehicles per day. If properly designed, this could be increased to 5,500. To achieve maximum capacity, lane widths should be 12 feet on heavily traveled roads where high speeds prevail and commercial vehicles are numerous. Capacity on such routes is reduced to 70% if lanes are only nine feet wide. Four-lane divided highways will accommodate between 18,000 and 20,000 vehicles daily in rural areas.

The elements of design affect the capacity of city streets the same as rural roads, with added complications due to traffic at intersections, curb parking and the movement of pedestrians. Because of lower operating speeds in cities, street capacity varies from 1,500 vehicles in each lane per hour on the most modern expressway to 300 per lane per hour on a normal four-lane street where parking and turning are permitted.

The presence of commercial vehicles in the traffic stream affects movement on all roads and streets. When 20 per cent of the traffic on a level multi-lane road is composed of commercial trucks, the volume of passenger cars is reduced to 83 per cent of the maximum.

In designing a road or street, provision should be made for mass transportation to assure the safety and convenience of bus passengers and the general traffic. Facilities for loading and unloading passengers outside the

## REVIEWS OF RECENT BOOKS

### FIELD ENGINEERING

This is the 22nd edition of a famous book, first published in 1880, but kept fully up to date. New material added includes a discussion of the methods of air mapping, more on the vertical curve, basic economics of highway and railroad location, latest surveying techniques, and other data. The latest revision is by Prof. Philip KISSAM of Princeton. Old-timers will remember the book as Searles & Ives. It is published by John Wiley & Sons, 440 Fourth Ave., New York. We do not have the price on this latest edition.

### PLANNING THE MODERN CITY

A new 2-volume book on "Planning the Modern City," written by Harold M. Lewis has just been published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. These books are especially intended for the city planner, engineer and other municipal officials. In Vol. I are covered: Population distribution and trends; land surveys; street traffic and design; transportation; public building location; zoning; development of shopping centers; and layout of recreational areas. This volume contains 284 pages and 251 illustrations. Vol. II opens with a section on community planning and replanning, including problems on parking, airport location and urban areas outside the city limits; and discusses the legal, economic and administrative problems of such community planning. Vol. II contains 224 pages and 118 illustrations. The price of each volume, whether ordered separately or together is \$6.

### SWIMMING POOL DATA & DESIGN

This is an exceptionally fine 98-page text-book on modern swimming pool design. It is intended as a "guide to consulting engineers" and due to its cost, it is probably not meant for general distribution. It covers: Selection of Site; Size of Pool; Designing the Pool; Purification Equipment; Selection of Equipment; Specifications for Equipment and Accessories; Concrete Specifications; and Useful Conversion Factors and Data. It is published by Refinite Corp., Refinite Building, Omaha, Nebraska.

### TIMBER STRUCTURE DESIGN

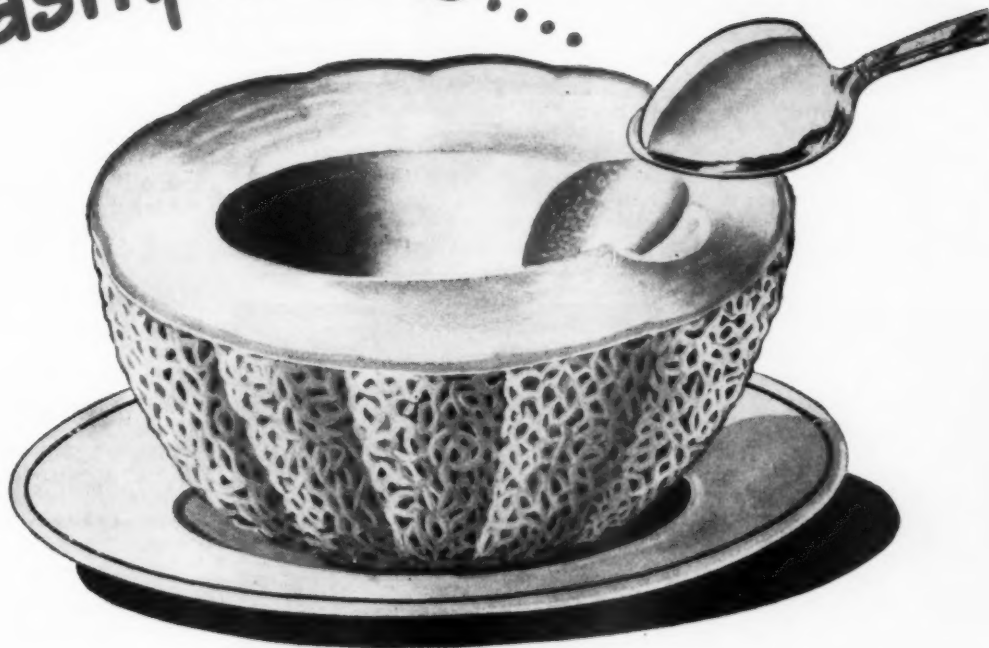
Modern methods of timber construction, with typical designs and much other data, are contained in this 116-page book. Covers specifically various types of roof design, bridges, trestles, towers, hangars and grandstands. It sells for \$10. Timber Engineering Co., 1319 18th St., N.W., Washington 6, D.C.

### CEMENT AND CONCRETE REFERENCE BOOK

This valuable 88-page booklet covers a wide range of material having to do with portland cement and concrete, including: Housing and farm uses; highways, streets and airports, with tables and charts; and special uses. Everyone who reads it will find something of value in the field it covers; and it is easy to read. The editors have done a fine job of getting out an attractive and easy-to-use text. Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill. Sent on request.



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traffic lanes should be incorporated in the original design because of the impracticability of adding them after the road is completed.

#### County Road Maintenance Costs

A review of previous maintenance studies in Washington and an analysis of maintenance cost data submitted by county engineers for this study indicate the following to be reasonable annual per-mile maintenance costs at the present time: Primary county roads, unsurfaced, \$200; gravel surfaced, \$550; low type pavement, \$450; high type pavement, \$300; or

an average cost of \$470 per mile. Other county roads, unsurfaced, \$100; gravel surfaced, \$400; low type pavement, \$300; high type pavement, \$200; average \$250 per mile.

#### Carbon Black from Sewage Gas

A writer to the *English Contractors Record* suggests the use of sewage gas for the manufacture of carbon black. Carbon black, said he, is manufactured from natural gas which, like sewage gas, is principally methane. Therefore the obvious ques-

tions are: "could carbon black be produced economically from sewage gas, and is the quantity of gas available sufficient to supply the demand?"

The answer to the first of these questions is that carbon black could be produced economically at a large sewage works. It can be produced from sewage gas by several processes. So can a number of chemicals of varying complexity; but of them all, carbon black involves the simplest process—combustion in an atmosphere deficient in oxygen.

As to the quantity available, it is stated that very varied yields—from 3 to 20 lb. of carbon black per 1000 cu. ft. of gas—are obtainable, or 1 to 7 lb. per head of population. The quantity of carbon black imported is upwards of 30,000 tons per annum and costs more than £1,200,000.

Thus, if the maximum efficiency of production could be ensured, the sewage of Greater London alone would very nearly be sufficient to cover the entire carbon black demand of the market."

#### Municipal Equipment Helps in Flood Control

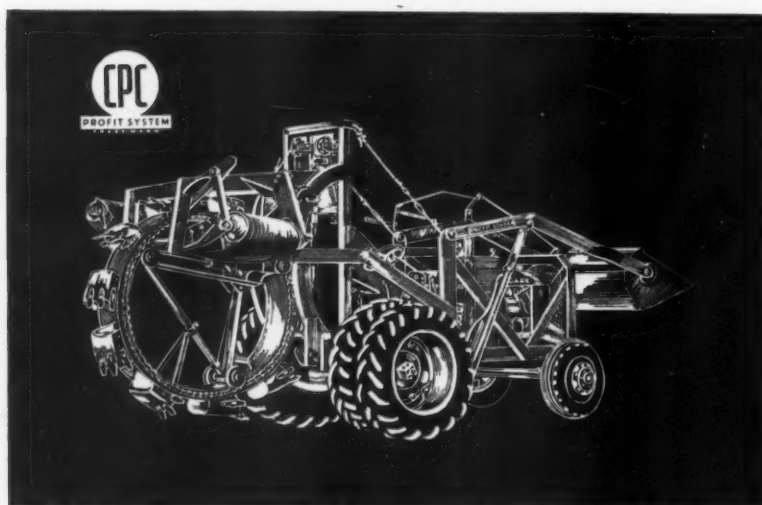
When the Connecticut River was threatening the dikes of Springfield, Mass., as 1948 went out, the necessity for faster filling of sand bags was apparent if the dikes were to be held. Charles A. Bailey, Superintendent of Streets and Engineering, and Silvio Tinti, foreman of the department's garage, found the answer in their own equipment.

A Hough payload shovel was used to handle sand into the body of the truck equipped with a sand spreader, formerly a lime spreader, but converted to apply sand to the streets. The spinner at the discharge end was removed and the endless chain in the truck body filled the bags as rapidly as 6 men could handle them into waiting trucks. This was the answer, the dikes held, and the river fell.

#### Factors Affecting Traffic Flow in Cities

The proper construction and design of new arterial routes in cities or the improvement of existing ones to accommodate large traffic volumes requires a knowledge of the factors that affect traffic flow and of the combined effect of the many variables present in urban areas.

Reasons for the wide disparity between capacities of city streets and expressways have long been known, but little progress has heretofore been



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EARTH AUGER  
REAR LIFT HOOK  
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The PROFIT TRENCHER does a *real* job, too. Trenches from 12" to 18" in width, up to 52" deep. Has 20 different digging combinations, swift "VAI" transport speed of 18 mph which saves time between jobs. Rubber tires are also gentle on lawns, golf courses, parks.

Complete combination of PROFIT TRENCHER, PROFIT LOADER and Case "VAI" costs far less than a competitive trencher *alone*. And there are many other PROFIT SYSTEM advantages. Ask your CPC-Case dealer for further details.

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4345 E. Imperial Highway, Lynwood, California

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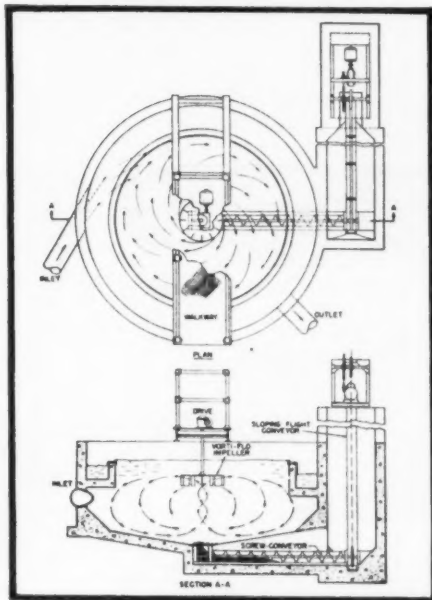
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- DELIVERS GRIT FREE SEWAGE
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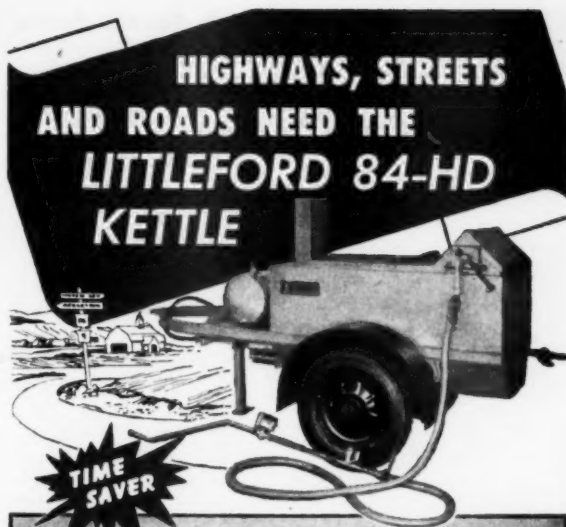


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84-HD Kettle using Hand Spray Attachment for Patch Work.

When the Littleford 84-HD Kettle is on a road maintenance job its faster heating, efficiency in operation and patented features make it a Time Saver, Cost Saver and Road Saver. No other Kettle has ever been designed with such painstaking effort as the 84-HD. This Littleford unit has patented features such as Double Heat Circulation System, which utilizes the entire heat of the Burner, and Screened Reservoir, which assures a continuous flow of hot materials even when cold materials are added during the heating. These features are the reason why the 84-HD has repaired more Roads, Streets and Highways than any other kettle on the market. To make the 84-HD even more efficient, a Hand Spray or Motor Spray Attachment can be added to this Kettle.



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# For Economy

IN *small towns*

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## Gar Wood LOAD-PACKERS

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- "The Load-Packers reduced our collection costs 39%."
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- "We are more than satisfied with the excellent work this piece of equipment has done."

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If you have problems in refuse collection from a cost standpoint . . . from a health point of view . . . from the manpower angle . . . call on Gar Wood. We are specialists in solving these problems for cities and towns of all sizes. Ask for Bulletin M-51 explaining how you can cut refuse collection costs and improve public health in your community.

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3806

# Digest of

## LEGAL DECISIONS

JOHN SIMPSON

### Coverage of Municipal Waterworks Bonds

MUNICIPAL waterworks bonds secured by waterworks property or income are issued by the city and not by the waterworks system, which has no corporate existence apart from the city. "It is like the city hall, the sewer system, and equipment owned by the city—merely a part of the city's property." Bonds are issued by the city, not by the waterworks as a public utility. And it was held that a statute authorizing the issuance of municipal waterworks mortgage bonds to reimburse the municipality for expenditures from the general fund for the operation of its municipally owned waterworks system did not authorize the issuance of "management bonds." *Roberts v. City of Madison*, 250 Wis. 317, 27 N. W. 2d 233.

### Purchase of Water Works by Town

THE charter of a water company supplying a town in Massachusetts with water contained a provision authorizing the town to purchase at any time the franchise and properties of the water company. The water company applied to the Massachusetts Supreme Court in a suit in equity for a declaratory judgment to determine the respective rights of the town and the water company as to the effectiveness of the vote recorded in a town meeting called to put the purchase into effect, and as to other matters in connection with the transfer. The facts were agreed upon.

The Supreme Court held that the town could buy the company's franchise and property under the company's charter provision without also complying with the Massachusetts general statute authorizing cities and towns to obtain a water supply from any corporation.

Although the town would acquire title to the property conveyed by way of contract and conveyance rather than by way of taking by eminent domain, a compulsory sale of this kind would, in certain respects, be analogous to a tak-

ing. The value of the company's franchise would be fixed as of the time of the vote authorizing the purchase and not as of the time of the conveyance. The company would remain in possession until the conveyance was made, if there should be no agreement to the contrary. In the interval, it would operate the water works for its own account and not as agent or trustee of the town.

It was undoubtedly the intention of the Legislature that the company's franchise and property should be turned over to the town as a going concern in full operation, so that the company would be held liable in the obligation of "good husbandry" while it retained possession of the property, as that term would be understood to apply to the special nature of the property. The parties, if desired, could regulate such matters by proper voluntary contract between themselves.

The town having, by its vote, definitely exercised its option to purchase, had completed the contract, and could not now rescind it, if for instance, it was confronted with a valuation of the property which it considered excessive without the consent of the company. But the court saw no obstacle to a rescission by agreement or consent. *Cohasset Water Co. v. Town of Cohasset*, 72 N. E. 2d 3.

### Arrearages for Water Rents

WATER rents do not constitute a lien on the property supplied unless this is so provided by statute in express terms or by necessary implication. Such legislation has been enacted in many of the states, but Congress has not enacted such a law for the district of Columbia. And, there being no statute expressly authorizing such a lien, "or making arrearages for water rents a lien on the property, a water company or municipal corporation has no right to cut off the water supply to the premises until the arrears due from a former owner or occupant are paid—in other words, no right exists to cut off the water supply to compel payment of a bill which

it is not the duty of the consumer to pay." *Farrell v. Ward*, Municipal Court of Appeals for the District of Columbia, 53 A. 2d 46. The court cited in support of its ruling decisions from other jurisdictions, Maryland, Utah, New York, New Jersey, Kentucky and Illinois.

It was accordingly held in this case that there was no duty on the plaintiff to pay the water bill unpaid by a former occupant, and he was wrongfully compelled to pay it; but it was also held that he could not, in an action against the Commissioners, Water Registrar and Collector of Taxes recover the amount paid to them or any of them. They were acting within the scope of their official duties and if they made a mistake in exercise of judgment or construction of the law, they could not be held personally liable in such an action, at least in the absence of a showing that the payment to the Collector was made under protest.

### Method of Assessing Cost Of Water Main

CONFIRMING an assessment against city lots for the cost of installation of a water main in the street fronting several of the lots, which lay between two streets, the Minnesota Supreme Court, *Ovale v. City of Willmar*, 25 N. W. 2d 699, applied the legal principle that an assessment for a public local improvement, regularly made under due legislative authority, is, in the absence of fraud, mistake, or illegality, conclusive; except that the questions of whether the property assessed received any special benefits from the improvement, and whether the assessment made exceeds, in a substantial amount, the special benefits received, are reviewable by the courts. In this case the lot owner claimed that two of the lots were in no manner benefited by the installation of the water main.

If the question of benefits is a matter upon which reasonable men may differ, the determination by the taxing officers will be sustained by the courts. The general rule is that the land assessed should be considered simply in its general relations and apart from its particular use at the time; and an assessment is not void merely because the lot is not benefited by the improvement owing to its particular use at the time. The benefit is not to the present use of the property, but to the property itself. The assessments here were calculated on a front foot basis. The fact that the assessment was uniform per front foot as against each abutting lot did not show or tend to prove that the assessment was made without regard to benefits.

## OPERATION DATA—MUNICIPAL POWER PLANT

	February 1947 200 p.s.i. Plant	March 1948 400 p.s.i. Plant
Gross Generation .....	1,201,400	2,407,000
Purchased .....	585,000	
Total Gross to System .....	1,786,400	2,407,000
Kwh/Bbl (Gross) .....	224	364
Fuel Cost per Bbl .....	\$2.04	\$3.25
Unit Cost (Fuel) ¢/Kwh .....	0.910	0.892
Heat Rate Btu/Kwh .....	28,500	17,500

## More Power for Gainesville

JOHN R. KELLY

Plant Superintendent, Water and Light Dept., Gainesville, Fla.

and

WILLIAM B. CROW

Black Laboratories, Inc.

equipment in the fall of 1945. Slow deliveries delayed the plant expansion until the spring of 1947. High bids for the construction of the building were rejected by the City Commission and the contract awarded a local bidder on cost-plus-fixed-fee, the work to be done under the direction of Thomas C. Calloway, Resident Engineer, the Plant Superintendent, and his competent assistant, R. G. Crosby.

The major plant equipment included a Westinghouse 6250 Kva generator and a Babcock & Wilcox Integral Furnace, 65,000-lb. per hour boiler. Automatic combustion control, including 3-element feedwater regulation, was furnished by Bailey Meter Company; pressure reducing and desuperheating stations were incorporated to furnish steam to the old plant and to certain auxiliaries. A Westinghouse 8000-sq. ft. surface condenser was installed, affording a low makeup water requirement. This condenser is of the divided water box type and employs twin circulating pumps to supply cooling water from a newly constructed spray pond. Circulating water from the condenser discharges into a well beneath the floor of the spray pond pump house, where it is picked up by vertical turbine type pumps and discharged through the spray nozzles. Three of these pumps serving separate sections of the spraying system make it possible to control the temperature of the pond water and conserve electrical energy when all sections are not needed. Bleed point extraction for condensate and feedwater heating contribute greatly to the overall plant efficiency. All switch gear is of the metal clad, totally enclosed type, and is connected to the generator and outdoor switching station now under construction, by means of insulated copper tubing. No lead

**G**AINESVILLE, Fla., has owned and operated its own municipal power and water plant since 1912. The original plant contained two steam engine driven generators operated on saturated steam of 150 psi. In 1921 the first steam turbine was installed. This was followed by two additional turbine driven generators with adequate boiler capacity to complete a 250-lb. plant of 4000 Kw. in 1938.

Cooling water limitations and the fact that fuel oil had to be transported by rail from the nearest port 75 miles away have caused considerable discussion as to the economy of operating the municipal plant. Even with a higher unit cost than attainable by a central station more favorably located, our plant has contributed over 38% of the revenue for running the city and has remained a sound industrial enterprise.

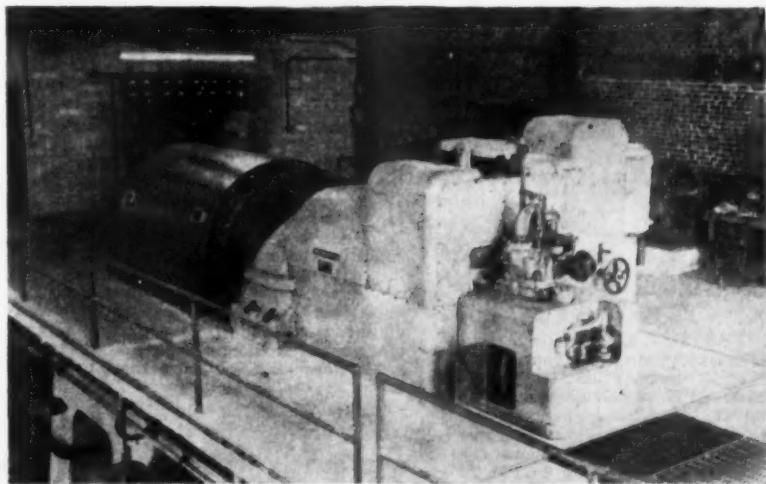
The three turbines of this plant exhausted into low-level jet condensers in which the steam was condensed by cooling water obtained from spray ponds. The main objections to this type of installation are its low thermal efficiency, loss of condensate and corresponding high percentage of makeup water.

In 1940 an immediate need for plant expansion was seen. High peak loads and increasing demand for electrical energy required operation of two of the three units, leaving only a fraction of the installed capacity as stand-by. Robert & Company, Architects and Engineers of Atlanta, Georgia, were retained by the city to initiate a survey to determine the future needs as to additional capacity. Recommendations for an addition were under consideration when the

attack on Pearl Harbor occurred, making any new construction impractical if not impossible. An order of the Federal Power Commission for an emergency tie with the Florida Power Corporation resulted in the construction of a 1500 Kw sub-station to insure continuous source of power to an air support base near the city.

### Plans for a New Plant

Planning of the new plant addition was resumed in 1945. At that time it appeared better to construct a modern 400 psi. plant of 5000-Kw capacity which would substantially cut fuel costs and improve the generating facilities of the present plant. The new plant was designed by Robert & Company and bids were received for



An interior view of the Gainesville plant.





Portion of spray pond.

covered cable was used in the entire job. Instead, Okolite Okeprene conductors housed in conduit and transite duct were used.

#### Plant Water Treatment

The makeup water is now furnished by a Type DJS Cochrane combination hot process softener and feedwater heater, treating the water with lime, soda ash and sodium aluminate, and reducing the hardness from 70 ppm

to about 10 ppm. Sodium aluminate aids coagulation greatly, making this low hardness possible. A high temperature processed lignin organic derivative is being fed after the filters to prevent feed line deposits and to protect the feed-water heater from similar incrustation.

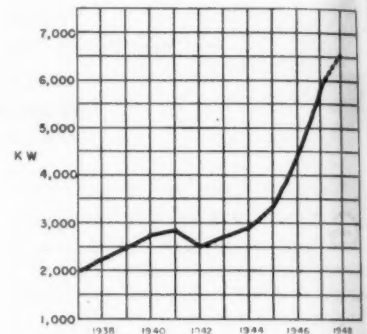
Chemical treatment is furnished by the National Aluminate Corporation. This includes an internal treatment of the boiler with anhydrous di-sodium phosphate and high temperature organic to scavenge oxygen and condition sludge so that it is maintained in a fluid condition. Correct concentrations are maintained by continuous blowdown, with main boiler blowdown to remove settled sludge. The pH of the condensate is controlled by addition of amines into the suction of the condensate pump, the pH being maintained at 7.4 which renders the return water non-corrosive and protects heat exchangers and piping.

Chemical tests, made by plant personnel every two hours, facilitate a close control of water treatment and boiler water conditions.

#### Performance Data

Comparison of the performance data obtained from operation of the new units in March, 1948, against

performance of the 250 psi. plant in February, 1947, shows a marked increase in efficiency. For instance, in February, 1947, 224 Kwh were produced per barrel of oil in comparison with 364 Kwh per barrel during March, 1948, effecting a heat rate of 28,500 Btu/Kwh for the old plant against 17,500 Btu/Kwh obtained by the 400 psi. plant. Operation of this new plant will save the city approximately \$13,000 per month in fuel oil cost based on the present price of \$3.25 per barrel, fob. Gainesville, which, in our minds, will go a long way toward justifying the construction of such an addition.



Annual peak loads in KW.

**COMPARE  
O. S. C.  
SEPTIC TANK  
CLEANING**



GORMAN-RUPP'S NEW "MIDGET"  
1 1/2" PUMP

**FASTEST**, self-priming, most efficient pump for general use. Weighs but 62 lbs. -- pumps 5500 GPH -- self-priming up to 30 ft. -- non-clogging, sturdy. Gorman-Rupp builds a complete line of pumps from the "HANDY", delivering 8 GPM, to large capacity pumps which deliver as high as 125,000 GPH.



#### WITH OLD FASHIONED, UNSANITARY METHODS

When a Sanitary Service Operator puts a new Gorman-Rupp Odorless Sanitary Cleaner on the job these are the results:—

1. A disagreeable job becomes pleasant, easy work.
2. Unsanitary methods and unhealthy conditions eliminated. Septic tank cleaning with an O. S. C. unit complies with or exceeds health regulations and requirements. It banishes open tanks, diaphragm hand pumps, shovels and other makeshift equipment.
3. It does each job more thoroughly, in

a fraction of the time previously required. For example, 500 gal. tanks are cleaned in 15 minutes, 1000 gal. tanks in 20 minutes.

4. It offers operators profit possibilities far in excess of income with present equipment and methods.
5. An O. S. C. unit has other profitable uses such as transporting water, emergency fire fighting, sprinkling, de-watering, etc.

Show this to Sanitary Service Operators in your community. For complete information write for Bulletin 7-ST-11.



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Improvements in the quality, and quality-controls, of U. S. Cast Iron Pipe are the fruits of research and development. They are also the rewards of patience.

Months of pilot plant operation may elapse before a process-development is adopted as standard

manufacturing procedure. Exhaustive tests in our headquarters research laboratory, one of the finest foundry laboratories, must precede a "go-ahead"

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## City-County

# PUBLIC WORKS

## Engineering Data

### Painting Creosoted Highway Posts

The Connecticut Highway Department has used several hundred thousand posts for supporting two-cable guardrails and the various highway signs. Most of these are of wood, pressure-treated with creosote, the color of which is the characteristic dark brown. In order that they might be more visible at night, many were painted white, but the creosote bled through the paint and the practice has been adopted of placing a band of reflectorized material around the top of the post.

### Bid Prices on Large Sewer

Bids were received Jan. 4, by the City of Omaha, Nebr., for constructing a large sewer in South Omaha. Alternate bids were taken on tunnel and open cut sections. On 3,330 ft. of 12-ft. storm sewer in tunnel, bids ranged from \$500 per ft. to \$393 per ft. For 13-ft. sewer in open cut, 2,287 ft. in length, bids ranged from \$280 per ft. to \$193. Sewers are to be of reinforced concrete, using class A-1 concrete. Low bidder was Michigan Sewer Constr. Co. of Detroit, with a total of \$2,074,531.

### Reducing Pollution of New York Harbor

The Interstate Sanitation Commission and New York City have agreed on a program for the prevention of pollution of New York Harbor. Under a 5-year program, the city agrees to complete sewage treatment works having an estimated cost of \$94,830,000. And within an additional six years, ending Dec. 31, 1959, the city will complete its entire sewage disposal program.

### DDT House Spraying in Louisiana

To protect military and other personnel against malaria during the war, a program of DDT spraying of houses was initiated in sections of Louisiana in order to determine what could be accomplished, and to find the most effective methods and amounts of DDT. Since the war ended, this work has been continued under the Public Health Service. John L. Porter has been in general charge.

In the continuation of the work, about 80,000 houses were sprayed in 1948 up to July 1. The spray is applied to interior walls and ceilings of houses, screens, porches and privies at the rate of 2 milligrams of DDT per sq. ft. Experience has shown that this amount will have an effective residual effect for at least 4 months against mosquitoes and flies.

### Cost of Garbage and Rubbish Collection

The cost of garbage and rubbish collection per ton in Easton, Pa., during 1947, according to the annual city report for that year, was as follows: Labor for collection, \$4.59; trucks for collection, 39.6¢; handling at incinerator, \$1.22; fuel, 16.5¢; supervision, 21.8¢; and maintenance and operation, 30.2¢. In most cases, the costs for 1947 were materially higher than for the preceding year.

The cost of ashes per load was, for collection labor, \$2.91; for trucks, 32¢; and for supervision, 19.3¢.

In all, during 1947, 6,646.9 tons of garbage and rubbish were collected and 960 tons were delivered at the incinerator by local trucks. City trucks collected 8219 loads of ashes.

### Preventing Foaming of Bituminous Compounds

When used with bituminous pipe jointing compounds, from 25 ppm to 50 ppm of a silicone compound will prevent foaming during heating. These data are based on laboratory experiments and may vary slightly with the compound used. This same compound can also be used for preventing foaming of bituminous street repair materials. It is also excellent for impregnating pump packings.

### Disaster Relief Mobile Unit

The Oklahoma State Board of Public Welfare has equipped and placed in service an emergency mobile unit to serve in areas stricken by fire, flood or tornado. It carries serums, anti-toxins and other medical supplies; four portable gasoline engine electric generators, and a radio receiving set. The equipment is housed in a Fruehauf body and mounted on a FWD truck. Emergency chlorination equipment is not mentioned, but certainly should be a part of the equipment.

### High Intensity Lighting for Airport

A high intensity lighting system is now being installed on the instrument runway at the Albany, N. Y., municipal airport which will make it one of the safest fields in the country. Light intensities will be sufficient for landings with one-eighth mile visibility and zero ceiling. It is believed that the new lights will eliminate 90% of the present bad-weather flight cancellations.

### Surplus War Materials for Waterworks

The Pasadena, Calif., Water Department during the year ending June 30, 1948, purchased surplus war materials from the War Assets Administration at a total cost of \$60,305, which is less than a fourth of the present market value. The materials purchased included steel pipe, copper tubing, gate valves, construction equipment such as revolving crane, welding equipment, ditching machines, trucks, trailers, and air compressors; also various pieces of machine shop equipment such as pipe threading machines, lathes, band saws, powerhammer, and a miscellaneous assortment of paint, hardware, office supplies, and cabinets.

# Handy Hypo for Healthful Water



Hypo-chlorination with HTH is the handy

"do-it-today" way to disinfect reservoirs, basins, flumes . . . to sanitize filters, tanks and aqueducts. Convenient HTH permits on-the-spot sterilization of newly-laid water mains and other strategic points in your water supply system. And when a main breaks, a flood strikes or other emergencies arise, HTH is on the job in a jiffy—if you have it on hand. So order your supply today . . . and write for the 1948 edition of Mathieson's factful booklet: "Hypo-Chlorination of Water". Mathieson Chemical Corporation, 60 East 42nd St., New York 17.

SANITATION HTH IS AVAILABLE IN CASES OF NINE HANDY 5-LB. CANS AND IN 100-LB. DRUMS.

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Sanitation HTH . . . PH-Plus (Fused Alkali) . . . Liquid Chlorine . . . Chlorine Dioxide . . . Caustic Soda Soda Ash . . . Bicarbonate of Soda . . . Ammonia, Anhydrous & Aqueous . . . Dry Ice . . . Carbonic Gas Sodium Chlorate Products . . . Sodium Methylate

# PUBLIC WORKS DIGESTS

Sewerage

Water Supply

Highways and Airports

*This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.*

## The Sewerage Digest

### Treating Wastes From Yeast Compressing

Compressed yeast wastes contain from 7,000 to 9,000 p.p.m. volatile solids, nearly all in solution. The B.O.D. is high, varying from 2,000 to 15,000 p.p.m., and the sulfate content varies from 2,000 to 2,500 p.p.m. The material is highly putrescible, increasing rapidly in B.O.D. upon standing.

The oxygen utilization proceeds in a manner similar to sewage, with an average  $K$  value of 0.063 for unseeded and 0.110 for seeded spent nutrients. The oxygen consuming value is higher than the B.O.D. values.

Laboratory experiments with electro-dialysis showed that with the best electrodes about 40 per cent of the oxygen consuming material could be removed. Spent nutrients treated with various inorganic and organic coagulants showed no material precipitation or clarification.

Willem Rudolfs and Eugene H. Trubnick—"Compressed Yeast Waste Treatment"; *Sewage Works Journal*, November.

### The Ohio River Compact

This compact went into effect on June 30, 1948. Effort toward interstate action to regulate pollution of the river began in 1908. In 1928 eleven states entered into an informal interstate pollution control agreement. In 1936 Congress authorized the states in the Ohio basin to negotiate an interstate compact for the control and abatement of stream pollution. Such a compact has now been ratified by eight states, Indiana, W. Virginia, Ohio, New York and Illinois in 1939, Kentucky in 1940, Pennsylvania in 1945 and Virginia in 1948. This and other interstate pollution control commissions now operate over 7% of the nation's surface area and 31% of the population.

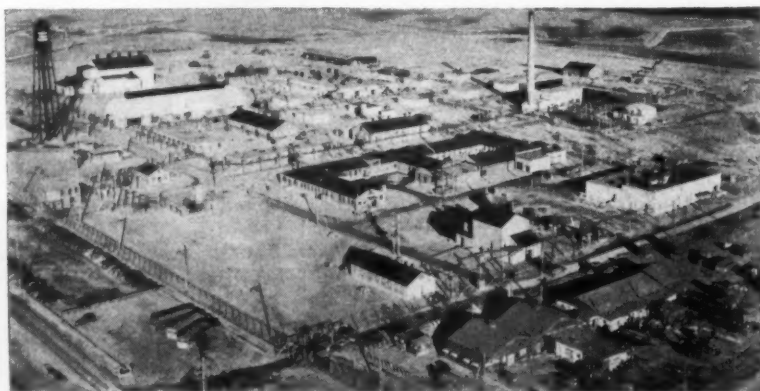
The Ohio River Compact specifies that sufficient treatment must be provided to remove at least 45% of the suspended solids from domestic sewage, and probably can be construed to include industries contributing polluting wastes. The budget of the Commission is divided among the states, one half in proportion to their population within the basin and the other half in proportion to the land area. Committees have been appointed on bylaws, policy, budget, and public relations, and an engineering committee consisting of the chief engineers of the health departments of the signatory states.

Kenneth S. Watson—"The Ohio River Compact"; *Water & Sewage Works*, January.

### Formulas for Sanitary Sewer Design

In a recent article, Richard Bennett of the Phoenix, Ariz., city engineer's office, indicted present-day practices for designing sanitary sewers on two counts: a wide variation in methods for estimating sewage flow, and a

scarcity of actual flow measurements in sewers from which specific-locality design-formulas can be derived. A number of engineers have commented on this article, their comments being, in general, that: (1) Before sewers are designed, every factor that might influence sewage flow should be fully evaluated. (2) Sewage flows vary widely with the type of occupancy in each area. (3) Actual sewage flows should be measured and studied to provide better design bases. (4) It should be recognized that per capita flows vary widely. (5) A design flow of 100 gpd per capita is not in great error. (6) Industrial discharges must be evaluated. One consulting engineer says: "Infiltration is a bugaboo of major importance, sometimes constituting more than half the design flow. . . . We feel better able to predict nature and extent of growth than to evaluate infiltration and storm flow." As to infiltration, an eastern consulting engineer says: "Conditions experienced along the (eastern) coastal plains would be much different from those at Phoenix due to the high



A view of the fabrication and experimental units of the Hanford, Wash., AEC installation. A vitrified clay sewer system was installed to provide for the city that has grown up around this plant.



## The Sidewalks of New York COVER HUNDREDS OF MILES OF CLAY PIPE

One of New York's latest projects is the enlargement of subway stations on the 4th Avenue line. City Engineers helped relocate city sewer lines to make room for bigger stations, specifying larger Clay Pipe lines where they were needed. Where the lines were to remain the same size in their new locations, the *original Clay Pipe* was used again.

**CLAY  
PIPE  
NEVER  
WEARS  
OUT!**

When Lawler and Blake wrote their famous song, "The Sidewalks of New York," in 1894, they didn't say anything about Vitrified Clay Pipe. Nevertheless, Vitrified Clay Pipe was there — it was underneath those sidewalks, an *unseen servant* of 2½ million people! And that same Clay Pipe, along with hundreds of miles of additional Clay Pipe sewers, is still serving New York's near eight million people.

### THERE ARE NO EXCEPTIONS TO CLAY PIPE'S LIFE SERVICE

Clay Pipe gives *lifetime service under any kind of waste disposal or soil conditions!* Chemically inert from the very beginning, selected clays are *heat-bonded at controlled fusing temperatures* into permanent, durable, rust-proof and corrosion-proof

Clay Pipe! Generations of faithful, trouble-free service everywhere prove the fact that engineers need make no exceptions to Clay Pipe's life service when they specify this material.

**If You Need Specific Information on a Clay Pipe Question, Write the Details to the Office Nearest You**

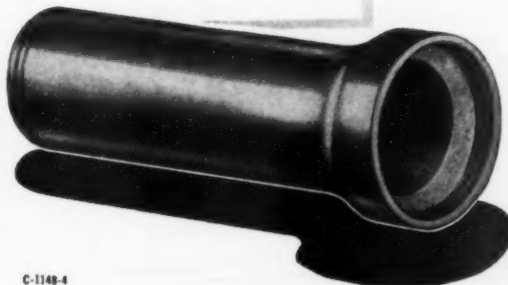
#### NATIONAL CLAY PIPE MANUFACTURERS, INC.

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*Vitrified*  
**CLAY  
PIPE**

C-1148-4

When you need special information—consult the READERS' SERVICE DEPT. on pages 85-88

water table and the sandy soil. The type of construction in the high water-table areas is very important and cannot be overstressed. Some installations require cast-iron pipe with lead joints to reduce infiltration to a minimum.

"Sanitary-Sewer Design Formulas;" *Eng. News-Record*, Dec. 23.

### Proposed Purification Of London's Sewage

The two outfall works of the London County Council, known as the Northern and Southern, receive the sewage and storm water from approximately 180 sq. mi. and 4.5 million population. A scheme of major develop-

ment at the Northern Outfall Works has been approved. This comprises sedimentation tanks to treat the whole of the flow, activated sludge plant on the diffused air system and sludge digestion plant to treat the whole of the sludge produced at the works.

These works are to be constructed during the next ten years in two parts, the first five-year plan comprises primary sedimentation tanks to treat at least half the dry weather flow, activated sludge plant to treat a further 30,000,000 gals. per day and sludge digestion plant to treat one half of the sludge produced at the works, i.e., 2,000 tons per day. The second five-year plan includes sedimentation tanks

to treat the remainder of the flow and further sludge digestion plant to treat the remaining 2,000 tons of sludge per day.

Provision will be made for the return of up to 50% of activated sludge and for recirculating the final effluent. The sludge will continue to be dumped at sea.

E. H. Vick and G. S. Clements—"London's Sewage Outfalls: Prospective Purification Developments;" *The Surveyor*, Dec. 17.

### Iron Pickle in Sludge Treatment

The adoption of vacuum filtration in England has been greatly retarded by the high cost of conditioning chemicals. Ferric chloride, the most efficient, costs about \$160 a ton and there are no reliable sources of supply. The same applies in a less degree to chlorinated copperas and ferric sulphate. The author suggests the use of spent pickle liquor as a source of iron salts. He estimates that enough of this liquor is produced in England to furnish soluble iron salts for treating all the sewage sludge in the country. But no process is known whereby ferric salts can be produced at a cost that makes their use economically practicable. Ferrous salts can be obtained from pickle liquor, but no method of oxidizing them by aeration has been devised, and the cost of chlorine there is very high and chlorinated copperas would cost about \$45 a ton. The possibility of oxidizing iron salts by electrolytic means has been considered. The author estimates the cost by this method would be a little over 50% of that by chlorine, with the current at 2¢ per kwh (but with no allowance for cost of plant, which was said, in the discussion of the paper, to be several times that needed for chlorination). Electrolytic treatment would necessitate the construction of pickling vats in the form of half-cells. One half-cell would contain the pickling acid and associated ferrous salts, the iron material being pickled forming the negative electrode. A diaphragm would separate this half-cell from the other, which would contain the spent pickle in which would be suspended carbon plates connected up to form the positive electrode. The material most suitable for the diaphragm, from the viewpoint of low voltage loss, is asbestos sheeting.

Ronald Hicks—"The Use of Iron Pickle in Sewage Sludge Treatment;" *Municipal Engineering*, Dec. 17.

### Odor Control at Key West Plants

The sewers of Key West, Fla., are laid on very flat grades and a large percentage of them below water level, with joints so inadequate that infiltration runs as high as 42% of the flow in the sewers. This condition so reduced the velocity of flow that much of the suspended solids settled to the invert, putrefied, and floating scum adhered to the top of the sewer. Therefore the sewage that reached the treat-

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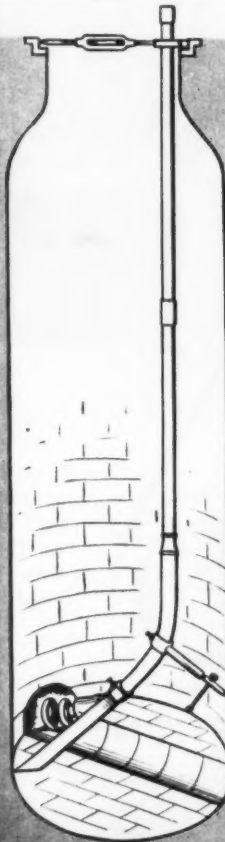
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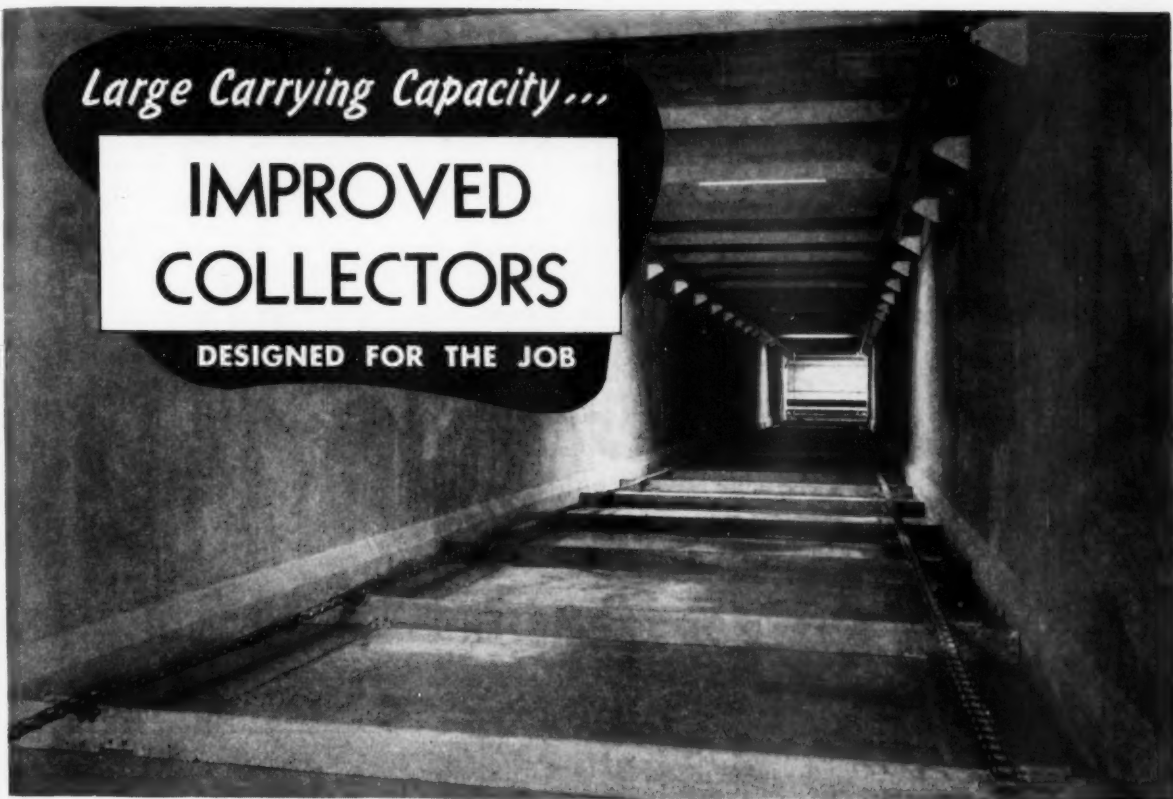
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ment plant was septic, and the sulphuretted hydrogen that escaped there discolored paint for six or eight blocks and caused loss of sleep and even nausea of citizens. Chlorine was applied at the rate of 200 lb. per 24 hr. without obtaining a trace of residual 25 ft. away. After laboratory tests of various chemicals it was decided to use activated carbon. After a period of experimenting to determine where best to apply it and at what rate, the practice was developed of feeding 0.06 grain of carbon per gal. of sewage, applying it 25 ft. above the bar rack. This rack and the pumps that lifted the sewage to the clarifier mixed the

carbon thoroughly. This eliminated the odors, destroyed most of the hydrogen sulfide, and permitted obtaining 0.1 to 0.3 ppm residual chlorine with only 75 lb. of chlorine a day.

W. C. Tims—"Odor Control at Key West Sewage Treatment Plants;" *Sewage Works Engineering*, January.

#### Control of Schistosomiasis

Schistosomiasis is a disease produced by one of three specific blood flukes: *Schistosoma mansoni*, *S. hematobium*, and *S. japonicum*. The flukes live in the abdominal veins and the eggs are expelled in the urine or feces.

The intermediate hosts in the life cycle of the schistosomes are fresh water snails, of which several species have been implicated. Of the three schistosomes, *S. mansoni* is of the most interest to the United States because it is prevalent in Puerto Rico and other Caribbean islands, Venezuela and Brazil. Schistosomiasis is contracted by wading in water infested with the cercariae of the schistosomes, which penetrate the skin within 15 min. after contact with it.

Control of the disease can be accomplished only by breaking the life cycle of the schistosome. Cercariae pass through ordinary rapid sand filters but not through diatomaceous filters, and chlorination is very effective, but it is impracticable to subject the entire flow of stream to such treatment. Environmental sanitation measures offer the most effective methods for controlling schistosomiasis, and emphasis must be placed on rural sanitation, sewage treatment and the safeguarding of water supplies.

E. J. Herringer—"Schistosomiasis Control as an Engineering Problem;" *Public Works*, January.

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Schistosomiasis Control as an Engineering Problem. By E. J. Herringer, Sr. San. Engr., U.S.P.H.S. January, Pp. 36, 38.

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Removal and Disposal of Grease. By Morris M. Cohn, Editor. January, Pp. 25-26, 38.  
Packing Plant Wastes Treated by Recirculating Filter. By E. F. Eldridge, Wash. State Pollution Control Com'n. January, Pp. 27, 37.

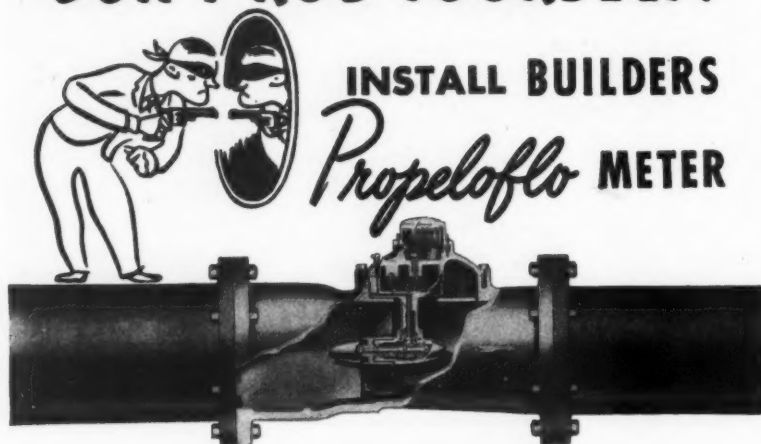
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# The Highway and Airport Digest

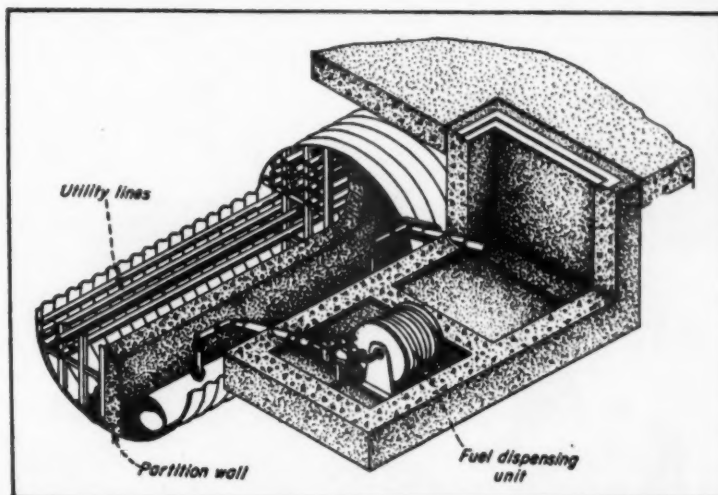
## Underground Airport Utilities

Because of congested apron conditions at most large airports, it takes about 30 min. to unload and load a passenger plane, service it and make it ready for take-off. The author believes that by putting all the utilities underground in a tunnel, with service pits under hinged covers, the turnaround time could be cut to 15 min. There are required at an airport, for each plane servicing operation, at least one fuel truck, one air-conditioning truck, one waste disposal truck, two fire extinguisher carts, one electric utility cart, two ladders for refueling use, and miscellaneous mechanics' tools. Utilities for performing all these services could be put underground in a 6½ ft. tunnel, with outlets for each loading position. Two men could bring a plane into the loading position, and perform the air conditioning, sewage, water, and other services, check tires and unload baggage, while two mechanics refuel, check oil, service motors, provide electrical connections and stand by for fire protection. The cost of such a tunnel is estimated at \$12,000 for each loading position. Refueling by trucks requires at least two \$15,000 trucks for each loading position.

E. R. Trammell—"Putting Airport Utilities Underground"; *Engineering News-Record*, Dec. 23.

## Gravel Pit Equipment Proves a Wise Investment

To provide all-weather roads on the gumbo soil of Kittson Co., Minn., requires an initial surface of 800 to 1000 cu. yd. per mile of crushed stone or gravel, with an additional 300 cu. yd. every other year. This demand has so used up the easily available gravel that it is not uncommon to have to haul gravel 30 or 40 miles to a job. A number of gravel pits located along the easterly border of the gumbo area had been worked out down to water level, about 5 ft. below the surface, and abandoned. To reopen them for underwater excavation of gravel, the county purchased a used slackline, a 57 ft. by 18" conveyor and a tractor equipped with a ½ cu. yd. "shovel loader," at a cost of \$8,000. With this, 15,000 cu. yd. of excellent road material was removed from an area of about one acre in 1947 and 13,000 in 1948. Gravel was removed to a maximum depth of 30 ft. below water level. Two men operate the equipment. The cost of gravel in the stock pile was 35 ct per cu. yd. in 1947, reduced to 25 ct in 1948 by more efficient operation. The



Courtesy Engineering News-Record

Duct under apron carries all utility lines.

shortening of length of haul to the road jobs alone has saved slightly over \$10,000.

J. S. Schmit—"How Modern Equipment Saved More Than It Cost"; *Public Works*, January.

## The Triaxial Compression Test

It is a serious drawback to the design of bituminous pavements and granular base courses that it cannot be placed on the basis of psi of flexural strength, shear, or similar property. Also it is difficult to find a common basis for comparing the stabilities of various materials, including bituminous mixtures made from different aggregates. The triaxial compression test provides a fundamentally sound basis of comparison for selection of base course and aggregate materials insofar as their stability is concerned. The triaxial compression test differs from an ordinary compression test in that provision is made for controlled lateral support while the specimen is subjected to vertical load. A cylindrical specimen of the material to be tested is inserted in a rubber sleeve between porous stones at top and bottom, and this is placed in a pressure chamber which is filled with water that can be subjected to any desired pressure, which pressure is exerted against the wall of the cylinder. Provision is made for exerting pressure or vacuum on the material in the cylinder. The vertical pressure is designated as V and the lateral pressure against the sides of the cylinder as L. With a constant L, V is varied

until failure. Several cylinders of a given material are tested under various values of L, such as 0, 15, 30 and 60 psi. The L and V for each test are marked off on a horizontal axis and a semicircle drawn on the line between them (V-L) as a diameter. These are known as Mohr circles; and a tangent common to all of them as the Mohr envelope or rupture line. This tangent is continued to cut the vertical axis, and the distance of this intersection above the base is designated cohesion c. For any specified value of L, the most stable material is that for which V-L is greatest. The value of c is positive for purely cohesive materials, is zero for purely granular materials, such as clean sand or gravel. Equations of stability have been derived and stability diagrams prepared for purely cohesive and purely granular materials and for materials having both cohesive and granular properties, on the basis of the geometrical and trigonometrical properties of a straight-line Mohr envelope for triaxial compression data.

Norman W. McLeod—"Triaxial Compression Test"; *Roads and Bridges*, December.

## Equipment Used By Cook County, Ill.

Equipment operated by the Cook County Highway Department comprises the following major items: 19 power graders, 15 rollers of 10 to 12-ton capacity, 66 trucks from 2½ to 8-ton capacity, four 7-yd. scrapers, five loader units, one ½-yd. shovel, 25 chip spreaders, eight tar-kettles, two 2-sack

concrete mixers, five 1,000-g.p.m. portable pumps, two air compressors, five 85-hp. tractors, one 20-ton tractor-trailer for hauling machinery, two 10-ton trailers attachable to trucks, six mowing machines operated with tractors and six sweepers. Forty-five trucks are equipped for snow plows, six being of the latest type available.

Major equipment maintenance and repair work is done in extensive shops at the LaGrange Park warehouse. These include a paint shop, for painting guardrail and signs, and also for housing the highway department's traffic-line stripers; a carpenter shop

equipped with sanders, a bandsaw, planers and other woodworking machinery; a blacksmith shop with forge, machine hammer, metal saw and drills; a welding shop with both an electric welder and oxyacetylene equipment, and an automotive repair section, where repairs are made to heavy equipment, including trucks, graders, rollers and other power units. A paint-spray room will soon be placed in operation, with special equipment to exhaust fumes.

The shops have a 10-ton overhead traveling crane, two 10-ton hydraulic lifts for automotive equipment, and a 2-ton portable hydraulic hoist for use

in removing motors, which has been found very efficient in relieving the 10-ton traveling crane. The shop is also provided with a battery charger.

"Machine Power is the Answer"; *Better Roads*, December.

### Soil-Cement Floor For Aggregate Stockpiles

Faced with the necessity of stockpiling aggregates which would require an area of over 3,000 sq. yd., a contractor for a Pennsylvania highway leveled an area of 84 x 333 ft. adjacent to a R. R. siding and paved it with soil-cement, using 12% cement in the top 2" and 8% in the balance. The equipment used comprised 2 spring-tooth harrows, a farm tractor, double-drum sheepfoot roller, motor grader, lime spreader, 3-wheel roller, water truck and 2 pick-up trucks used as pneumatic rollers. Cost less than \$2,500.

"Soil Cement Floor for Aggregate Stockpiles;" *Roads and Streets*, December.

### Prestressed Concrete In Highway Bridges

The advantages of prestressing concrete in the construction of highway bridges are as follows:

(1) Under permanent bending moment, the section can be designed to be stressed to lower stress limit at top surface and upper limit at the bottom. When the rolling load is added, the stresses pass to upper limit on the top surface and lower limit on the bottom surface. Hence the whole capacity of the beam from maximum upwards bending to maximum downwards bending is available for the support of the rolling load, and the deadweight, within certain limits, affects neither the concrete section nor the steel section but only the eccentricity of the latter.

(2) The compressive stress enables the end sections to bear very high shear loads, through its effect in reducing principal tensions. Cables, moreover, can be bent up towards their extremities, producing an active vertical force acting against the shearing loads. In large span bridges, vertical prestress as well may be economically applied to the webs, producing a two-dimensional compression which can completely eliminate all resultant tensile stresses.

(3) The prefabrication of bridges, large and small, is made possible, the component parts being assembled into an elastic monolithic mass by the prestress. This suitability for prefabrication enables concrete to be made under factory conditions, with a resultant increase in strength and reliability.

(4) From the point of view of the quality of the finished article, there are numerous advantages, amongst which might be mentioned:

(a) Complete freedom from cracks within a known range of load, resulting in excellent protection of the steel.

(b) Small deflection under design load. A typical 160 ft. span bridge of 7 ft. depth has a deflection of the order of 1 in. under test load.



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(c) The existence of a large range of load over the design load in which cracks and large deflections appear, but disappear completely on removal of the excess load.

(d) Very high resistance to repeated and alternating loads even when exceeding the design load.

(e) An automatic safety factor in that both concrete and steel in the structure are never more highly stressed than under the initial prestress.

(5) Certain practical advantages spring from the above, notably:—

(a) A certain reduction in quantities of concrete and a very considerable reduction in quantities of steel used in the structure.

(b) Considerable reduction in depth of section, not only relative to reinforced concrete but also relative to steel.

The three methods of prestressing in use are jacking, post-tensioning and pretensioning. For bridges under 30 ft. span, precast beams can be used. Slab bridges of 20 to 80 ft. span can be constructed by casting in place, by using prefabricated strips assembled by transverse prestress, or using segments assembled into strips by longitudinal prestress, which are placed and assembled by transverse prestress. Beam bridges are made in France with I-shaped prestressed beams having a broad upper flange and deep narrow lower flange, the upper flanges forming

the deck and being prestressed transversely. The span is usually 20 to 27 times the depth. Arch bridges theoretically should be in no tension, but practically they are and prestressing is advantageous. Prestressing is being considered for continuous girder bridges, bowstring arch bridges, and portal frames.

A. J. Harris—"Prestressed Concrete in Highway Bridges," *The Surveyor*, Dec. 10. *Contractors Record*, Dec. 15.

### Blasting Rock Without Throwing It

U. S. Route 22 in Pennsylvania is being widened or relocated. At one point it and double tracks of the P.R.R. share a narrow bench on a jutting shoulder of Peters Mt., and the road work required removing 500,000 cu. yd. of rock in almost vertical cliffs which in some places were only 6 ft. from the nearest rail. This was accomplished without once blocking the tracks with blasted rock. Blast holes were sunk 8 to 24 ft. deep in four rows 7 ft. apart, the outer row at least 10 ft. from the face of cliff. These were loaded with electric caps with milli-second delays. Instantaneous caps were used in the second row from the back; No. 1 delays in the rows on each side of this, and the line nearest the track with a slower delay. The instantaneous row lifted first and made room for the other rock to move into this space instead of toward the tracks.

"Milli-Second Detonation Blasts Cliff Close to Busy Railroad Track," *Construction Methods*, January.

### Drainage of Embankments

To prevent surface drainage from roads or embankments from washing the slopes of the embankments, California constructs gutters along the outer edges of the embankments to carry the water to a safe point for release. These are made by building a low dike along the edge. At first these dikes were of earth 1 ft. high, 1 ft. wide on top and 4 ft. wide at the bottom. These were frequently damaged by cattle and by erosion, interfered with snow removal and were damaged by it. Later they were lowered to 8" high and the bituminous shoulder facing was carried up to and across the top. This type is now being replaced by a dike of all-bituminous mixture, which requires less width of base and therefore less encroachment on the shoulder. Contractors have invented mechanical devices for distributing, finishing and compacting these dikes. A windrow sizer and shaper, propelled by the truck that dumps the hot mix into it, leaves a smooth, shaped windrow. This is compacted by means of a tapered, double-wall shell, the front of which is as large as the windrow and the rear is the size of the finished dike, the weight of which provides a high degree of compaction. A burner heats the space between the walls of the shell and furnishes sufficient heat to provide a hard glaze on the surface



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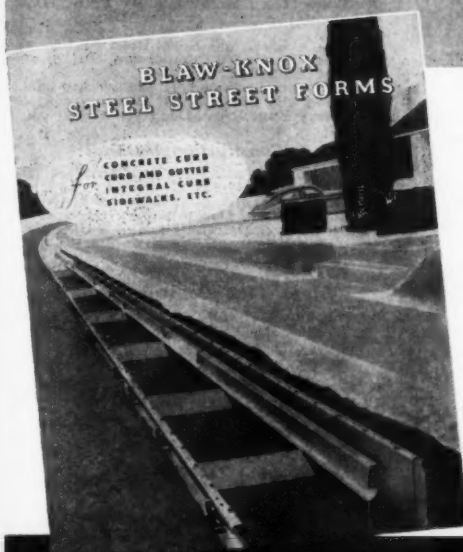
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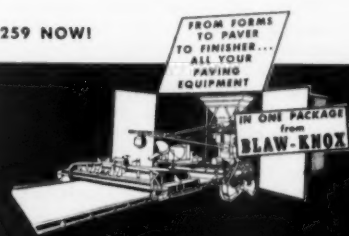
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of the dike. This requires 5.8 tons of plant mix per 100 ft. The plant-mix dikes are more durable, more sightly and more serviceable than any other type and well worth the small additional cost.

F. W. Haselwood—"Drainage: New Method of Removing Water From Highways"; *California Highways*, November-December.

### Rubber in Asphalt Pavements

The use of powdered rubber as an admixture to asphaltic concrete was tried in paving a street in Akron, O., in 1947, and in 1948 they resurfaced about a mile of 24-yd. old brick pavement, using standard specification asphalt on one-half of the street and a rubber-asphalt mixture on the other half. Two percentages of rubber were used, 5% and 7½% by weight. The asphalt was heated to about 300°F and the rubber powder was sifted in slowly and mixed for 2 hr. The rubber increases the ductility and water resistance, thereby making the asphalt less sensitive to temperature changes. It is expected that the rubber additive will increase the life of the pavement and reduce the maintenance cost. The added cost is about 10c per sq. yd. 1½" thick.

"Powdered Rubber Admixture," *Roads and Streets*, December.

### Aluminum Alloy Bridge

"The first movable bridge in aluminum to be erected in the world was opened at Sunderland (England), on Friday, Nov. 26." (See in September, 1948, *Digest* the claim for the first aluminum highway bridge in the world.) This is of the double-leaf trunnion bascule type, designed to carry both road and rail traffic. Aluminum alloy is used for all of the movable span except a few minor details, and the weight of the bridge is about 40% of the weight of an equivalent steel structure. The length between trunnion bearings is 121' 1½". The bridge is designed for loads of a 70-ton bogey on two axles or a train of 15-ton axle loads at 10-ft. centers for the railway and a 75-ton trailer on two 4-wheel axles for the roadway.

"World's First Aluminum Alloy Bridge," *The Surveyor*, Dec. 3.

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Road Equipment Adapted to Soil-Cement Stabilization. December, Pp. 44-45.  
Milli-Second Detonation Blasts Cliff Close to Busy Railroad Track. January, Pp. 66-68.

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Developments and Trends in Bituminous Road Surfaces. By R. Slater. Dec. 1, Pp. 19-21; Dec. 8, Pp. 11-14.  
Prestressed Concrete in Highway Bridges. By A. J. Harris. Dec. 15, Pp. 21-25. Dec. 22, Pp. 19-25.  
Motor Roads at £175,000 Per Mile. By E. C. Boyce. December 29, Pp. 9-10, 20.

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A New Approach to Pavement Design. By Jacob Field, Consult. Engr., V. A. Endessey, Shell Development Co.; L. E. McCarty, Texas H'way Dept.; Bernard H. Knight, Prof. of H'way Engr., Johannesburg; K. B. Woods, Assoc. Dir., Purdue Univ. Dec. 23, Pp. 60-63.  
Can Equipment Speed Combat Rising Earthmoving Costs? By D. K. Heiple, R. G. Le Tourneau, Inc. Jan. 6, Pp. 70-73.

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Developments and Trends in Bituminous Road Surfaces. By R. Slater. Dec. 24, P. 358.

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Functional Airport Design. By Edward Payson Hall, Airport Consultant. January, Pp. 22-24, 26.  
How Modern Equipment Saved More Than It Cost. By J. S. Schmit, County Engineer. January, Pp. 29-30.

### Roads and Bridges

Triaxial Compression Test of Bituminous Paving Mixtures. By Norman W. McLeod, Dominion Dept. of Transport. December, Pp. 67-72, 90.

### Roads and Streets

New York's Expressway Program. By Robert Moses, Construction Coordinator of New York. December, Pp. 51-55.  
Soil-Cement Floor for Aggregate Stockpiles. December, P. 58.  
Saving Concrete Sidewalks. By William J. Chadwick, City Engr., Racine, Wis. December, P. 64.  
California's Heaviest Road Job. December, Pp. 67-70.  
Tunnels and Conveyors Helped Hot-Mix Contractor Race with Frost. December, Pp. 72-74.  
Converting Triaxial Test Data. By R. J. Hank and Harry A. Sandberg, Jr., Engrs., Texas H'way Dept. December, Pp. 75-79.  
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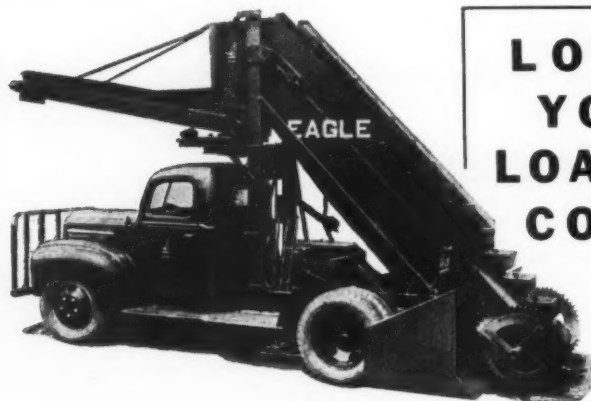
Up-to-Date Methods of Making Coated Macadam. By A. J. Lyddon. November, Pp. 39, 41, 43.

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Impressions of Civil Engineering Work in Western United States. By Matthew E. Habershon, Boro Engr. of Walsall. Dec. 17, Pp. 675-676.  
Bitumen—For the Non-Specialist. By Robert Saunders. Dec. 24, Pp. 683-684.

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Het Rijkswegenbouwlaboratorium to Scheveningen. November, Pp. 211-219.



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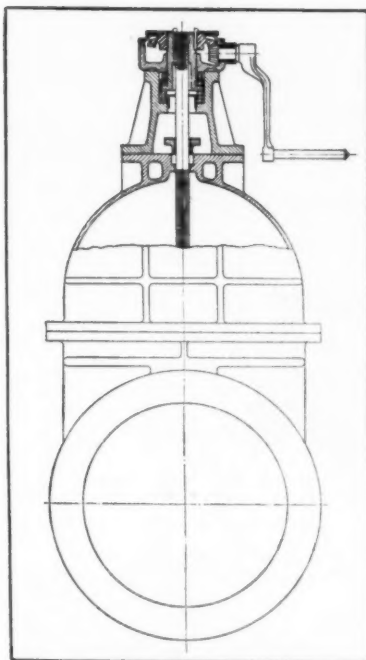
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# The Water Works Digest

## Operation of Gate Valves

To close a 36" gate valve in a line with 80 psi pressure requires a force of 2700 ft.-lb. applied to the stem, but the AWWA specifications pay little attention to securing adequate manual operating mechanisms for such conditions. Mechanisms available for this include: 1. Operating nut or hand wheel attached to valve stem. 2. Bevel or spur gears—open type without ball bearings—with the proper ratios. 3. Bevel or spur gears enclosed in a grease case without ball bearings. 4. Geared ball-bearing operating head. For 14" valves or smaller, a standard inside-screw gate valve with a nonrising stem may be satisfactory; but for larger valves a sliding-stem type with a rising extension stem is usually necessary; in the latter, the thrust of operation is taken by the ball bearings in the operating stand, the threaded section of the stem is out of the water and accessible for lubrication, and the sliding stem is not subjected to torsional strains if an anti-torsion device is supplied.

Donald M. Belcher—"Operation of Water Works Gate Valves;" *Jour. AWWA*, December.



Courtesy Journal AWWA

### Ball bearing head on valve.

## Lining 62-Inch And 36-Inch Steel Pipe

St. Louis in 1925-26 laid several miles of 62" riveted steel pipe with telescoping joints at 7'6" intervals. The pipe had been coated by heating and dipping in hot asphalt. In 1935 leaks developed at three locations, and were uncovered and patches welded over them. It was noticed that at most places where pitting occurred, organic matter such as sticks and leaves had been deposited next to the pipe during back-filling, and in most cases, *Sporovibrio Desulfuricans* was found in the soil. Repairing this leakage in 1936 cost \$385, and as further leaks developed, the cost of repairing them increased until, in 1946, the cost of repairs was \$9,604, and it was decided to line the pipe with concrete. At the same time about a mile of 36" steel pipe, where there was considerable leakage, was lined. Contract for the work was let to the Centrine Corp. at \$4.20 per foot for the 62" and \$3.35 for the 36". Cleaning the pipe lines was sublet to the National Water Main Cleaning Co. It required a flow of water at the rate of 35 mgd to propel the 62" cleaning machine. After cleaning, disintegrated coating and rust were removed by hand scrapers and wire brushes and holes plugged; and just prior to applying the lining, moisture was wiped off with burlap.

In lining the pipe, mortar composed of 5 bags of portland cement, 6 cu. ft. of dry fine sand, and 24 gal. of water

per batch was thrown centrifugally against the pipe surface by an electrically driven machine, giving a lining  $\frac{3}{8}$ " thick. As soon as possible the lining was inspected, water admitted to the pipe and all openings closed to keep the humidity high for curing. The Hazen-Williams "C" after lining was found to be 141, while it was 124 when first put into service. The saving resulting from lining is estimated to be \$10,370 annually, or 13% of the cost.

John B. Dean—"Lining 62" and 36" Pipe Returns 13% on Cost," *Public Works*, January.

## Bactericidal Properties of Chlorine

In general, the primary factors governing the bactericidal efficiency of both free and combined available chlorine are:

1. The time of contact of organism and bactericidal agent—the longer the time, the more effective the disinfection.
2. The temperature of the water in which the contact is made—the lower the temperature, the less effective the disinfection.
3. The pH of the water in which contact is made—the higher the pH, the less effective the disinfection. Thus, when the combination of high pH and low temperature is encountered, the poorest results are to be anticipated.

Comparing the relative efficiency of

free and combined available chlorine, it can be stated that:

1. Under the most favorable conditions—that is, at a pH of 7.0 and a water temperature of 20° to 25°C.—100 per cent kills cannot be obtained with combined available chlorine residuals of about 1.2 ppm. in 10 minutes, but they may be obtained with 20 minutes of contact. Under similar conditions, with free available chlorine, 100 per cent kills are obtained with 0.04-ppm. residuals in one minute of contact.

2. To obtain a 100 per cent kill with the same contact period requires about 25 times as much residual combined as free available chlorine.

3. To obtain a 100 per cent kill using the same amounts of residual combined and free available chlorine, combined available chlorine requires approximately 100 times as long a contact period as free available chlorine.

C. T. Butterfield—"Bactericidal Properties of Free and Combined Available Chlorine;" *Jour. AWWA*, December.

## Electrical Logs Record Quantity And Quality of Groundwater

By electrical logging of wells in Texas, presence or absence of water-bearing sands has been determined with a greater degree of accuracy than conventional methods permit. The electrical log consists of two or more resistivity curves and a self-potential curve, photographically plotted to scale against well depth. By it, stratigraphic sequence of geologic beds may be determined with greater accuracy than by the driller's record; and correlation of water-bearing sands over wide areas is possible. Electrical logs can be used for forecasting water quality, by considering the fact that an increase of salts in solution in the interstitial water causes a decrease in resistivity, and by assuming that the electrochemical action is the major factor contributing to the self-potentials recorded on the electrical log. The principal use made of this quality forecast is to indicate with reasonable accuracy the limit below which it is useless to prospect for potable groundwater.

B. A. Barnes—"Estimating Groundwater Supplies with Electrical Logs of Wells;" *Eng. News Record*, Dec. 23.

## Removing Hydrogen Sulfide From Well Water

Methods of removal depend upon raw water quality, plant capacity, design of equipment, predicted operation, process or other requirements, and availability of stack gases or acid. Aeration alone can reduce the sulphides to below 3 ppm, but the free sulphur released is objectionable. Reduction of



pH will reduce the dimensions of the forced draft aerating equipment to a fraction of the size required when the pH is 7 or above. Aeration removes the sulfides by oxidation as well as by scrubbing action. Forced-draft aeration combined with pH reduction is far more effective than cascading or natural-draft aeration. Reducing the pH with  $\text{CO}_2$  gas injected into the water before aeration is not effective; much less so than adding the gas to the bottom of the aerator. Use of  $\text{CO}_2$  with pH reduction, followed by aeration is quite satisfactory if the total sulfides are in the range of from 3 to 4 ppm; but is not if alkalinity and sulfide concentration

are very high. In removing sulfide by pH reduction, as the pH is reduced, more and more of the total sulfides are converted to hydrogen sulfide. To reduce the sulfides to zero, secondary chlorination is required.

Sheppard T. Powell and L. G. von Lossberg—"Removal of Hydrogen Sulfide From Well Water;" *AWWA Journal*, December.

### Slime-Forming Organisms

The microbiological slime-producing potential of water supplies cannot be definitely determined by ordinary laboratory techniques, because of the wide

variation in nutritional and temperature requirements of micro-organisms. If a nonspecific sterilizing agent is being used, the counts on nutrient agar before and after treatment are, however, indicative of the degree of sterilization.

In the investigation of industrial slimes, a clearer microbiological picture can be obtained by direct microscopic examination than by attempting to culture the material on laboratory media.

Micro-organisms can be very troublesome in industrial processes because of their ability to produce large quantities of slime. This is not a property of a few but probably of all micro-organisms when the environmental conditions are favorable.

This information can be helpful in selecting the type and quantity of disinfectant to be used, although variations in such factors as pH, temperature and organic matter content, all of which affect the activity of disinfectants, make it impossible to state that a certain dose of any chemical will control the growth of any particular organism in all industrial systems.

F. B. Strandskov—"Slime-Forming Organisms;" *Jour. A.W.W.A.*, December.

### Concrete 10-Ft. Pipe Intake for Cleveland, O.

The lake section of the Nottingham intake for Cleveland will consist of 18,500 ft. of 10-ft. reinforced concrete pipe, which is being made in 24-ft. lengths. The walls are 10" thick and are reinforced with steel rods in three cages, two of them circular and one elliptical. Each pipe weighs 50 tons. They are being cast on a 6-acre site which can contain a maximum of 350 pipe at one time. Pipe construction was begun last May and laying them was expected to begin in August, and the full yard of 350 pipe was completed before laying began in September. The pipe are cast vertically in steel forms. When the forms have been removed pipe are coated with a membrane sprayed on for curing. When the pipe is 72 hr. old, the base ring is knocked off and the pipe stands on the ground 28 days more for curing. When it is to be used, it is lowered onto its side and rolled to a traveling gantry crane, which carries it to a barge-loading dock.

"New 150 mgd Intake at Cleveland, O."—*Eng. News-Record*, Nov. 25.

### Identification of Water From Leaks

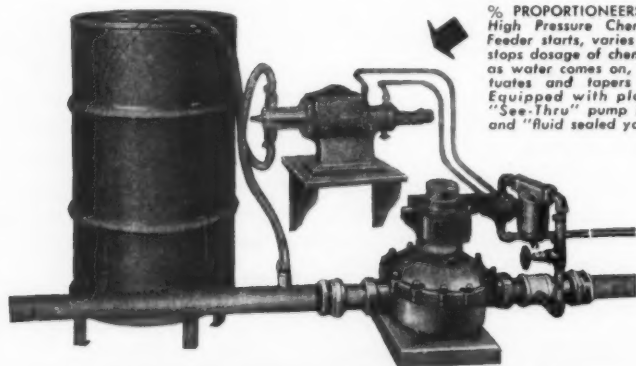
An English method of determining whether water emerging from the ground or into a cellar is from a leak in the city mains or not consists of applying phenol red to both city water and suspected water, and analyzing both for hardness, chlorides, electrical conductivity, nitrites, nitrates, lime, metals, sulfites, sulfates, nitrogenous matter, free ammonia and calcium. "A selection, or in some cases all, of these tests are employed, according to circumstances." In passing from the main to the outlet, the water some-

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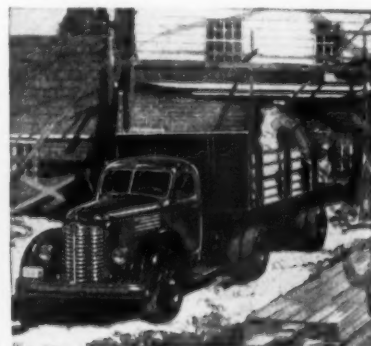
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times acquires an extra degree or so of hardness or a little more chlorides, but seldom anything more.

Arthur Gilbert — "Aids to Waste Water Detection Used in England"; *Water Works Engineering*, November.

### Small Treatment Plants

The author considers as "small," plants treating 0.5 mgd or less. The Ohio Dept. of Health regulations for filters require 2 gpm per sq. ft. for surface waters; 3 gpm in softening and iron removal plants using ground water; rate controllers are required for all filters; open gravity filters are required for all surface waters, but pres-

sure filters are permitted in softening plants that treat ground water; settling basins giving at least 4 hr. detention are required.

The author offers a number of suggestions, among them the following:

**Chemical application** for small plants is best provided by solution feeders. For **recarbonation**, kerosene burners are more satisfactory than coke burners; the use of dry ice has many advantages, though perhaps more expensive than combustion. For **gravity filters**, 25 sq. ft. is about the smallest practicable for concrete construction; steel shells, some only 5 or 6 ft. diameter, are used occasionally. **Rate controllers** are most economically constructed by using a

float chamber which provides a constant head over an orifice. **Pumps** in a softening plant which take suction from the settling tank often have incrustation form on the runner and housing; this can be avoided by taking suction from the filter effluent. Applying vitreous phosphate to the suction will prevent incrustation. For **filter bottoms**, use of carborundum plates should prevent displacement of gravel. **Disinfection** is usually best accomplished with hypochlorite rather than liquid chlorine.

Thomas R. Lathrop—"Small Water Treatment Plants;" *Jour. A.W.W.A.*, December; *Water & Sewage Works*, January.

### Extensions to Suburban Areas

Representatives of seven cities described their methods of extending water mains. Springfield, Ill. has four methods: 1—The special assessment plan, for new and thinly settled additions, the owners paying the cost. 2—The certificate plan, under which one or more owners pay the cost, the city refunding the most of laying 35 ft. for each new customer. 3—The new customer plan, for old parts of the city, under which the city extends to an adjacent block, free of charge, 35 ft. for each property owner who contracts to use the water. 4—The contract plan for extensions outside the city; the customer pays for the main, and the city repays to him sums collected by it from others who connect to the main until they total 120% of the original cost.

In Oklahoma City and also outside the corporate limits, the construction cost of new mains is paid by the customers and refunds to him made annually, beginning with the first year in which the gross income from the extension, in the form of water rates, totals at least 10% of the cost. Rates charged outside the corporate limits are 150% of those inside for the first 500,000 gal. per month; above that, they are the same.

The water board of Utica, N. Y. supplies territory outside the city, also 5 incorporated villages and 15 water districts. In adjacent territory it extends mains free at the rate of 50 ft. per customer served, who pays for any beyond this at the estimated cost of 6" pipe, which payment is refunded at the rate of the cost of 50 ft. of pipe for each new customer. In incorporated villages and water districts, the governing bodies agree to pay, for fire protection, 1 ct per inch-foot of main plus \$12 a year for each fire hydrant.

In Seattle, Wash., the cost of all service mains is assessed against the abutting property. A developer of an outside district constructs mains according to the water department's plans. If residents of a thinly populated area petition for service, the property owners pay the cost, divided on a presently occupied front foot basis.

Atlanta, Ga. supplies approximately 100,000 people in 6 communities and 4 counties, under two plans—wholesale metering to incorporated communities;



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and retailing customer service in unincorporated county areas. Rates outside city limits are double those inside. In extending mains into unincorporated areas, 2" galvanized pipe and smaller is used for non-fire service, and paid for by the applicant. For fire service, 6" c. i. pipe is used, the applicant pays the cost of all material, and the county opens and closes the trench.

Wilmington, Del., by state enactment, may distribute water in all territory within 10 mi. of the city boundary, and has 3600 accounts in such territory. Rates are double those within the city, except for manufacturers, who pay the same as those in the city. All outside extensions are made at the expense of the applicant, with ownership vested in the city.

S. T. Anderson, M. B. Cunningham, C. M. McCord, H. B. Miles, W. C. Morse, Paul Weir and W. C. Wills—"Service Extensions to Suburban Areas"; *Jour. Am. W. W. Ass'n*, December.

#### Pretreatment Of Difficult Water

From experience and experiments in purifying the water of the River Avon for supplying Ryton, England, the following conclusions were drawn:

(1) Biological pre-treatment of waters from doubtful sources appears to offer great advantages and should be the subject of further investigation.

(2) The sedimentation stage in modern waterworks practice may be expected to assume greater importance, possibly at the expense of filtration.

(3) The destruction of harmful bacteria is the first and most important consideration in the treatment of a doubtful water intended for public supply, and should be featured at as early a stage as possible in the sequence of treatment.

(4) Chlorine can be considered an effective and reliable means of destroying harmful bacteria in drinking water since it has been proved continuously in use under the most difficult circumstances. To be fully effective it should be used in its free available state.

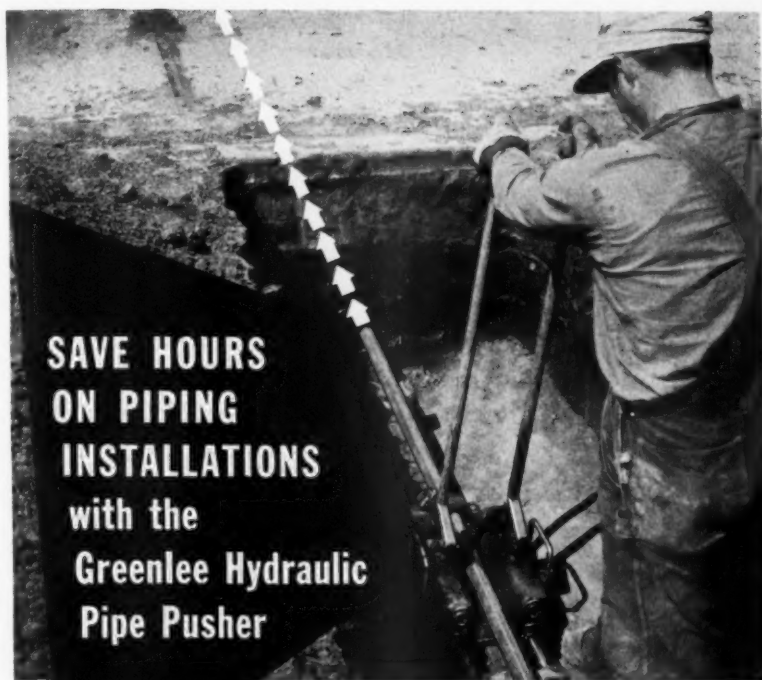
(5) Only by reference to long period records of the various characteristics of a raw water can the necessary treatment works be designed to combine safety with true economy.

Norman J. Pugh—"Treatment of Doubtful Water for Public Supplies;" *The Surveyor*, Dec. 10.

#### Pumps And Motors

In designing a pumping station, if several side-suction side-discharge single-stage centrifugal pumps are selected, space can be saved by installing the pumps at an angle. Bottom-suction side-discharge, entirely free from piping on one side, is the most practical type for medium-size and large pumps. Bottom-suction bottom-discharge gives a clean-cut appearance on the pump room floor but often leads to pipe and foundation complications.

Electric motors are generally the first

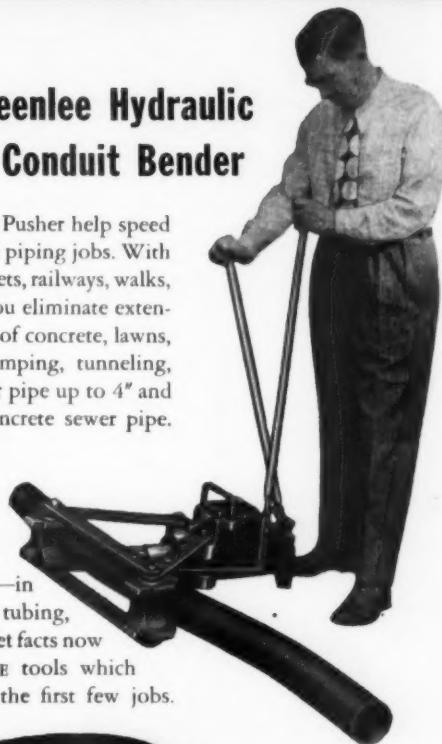


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choice for power, but with the geared steam turbine the head and capacity can readily be varied. The gasoline engine is well suited to serve as a stand-by source of power. The principal electrical equipment used in pumping stations are transformer substations and motors, their control and switch gear. An outdoor substation of the unit type embodies a compact assembly of a polyphase transformer, high- and low-voltage lightning protectors, high-voltage protective links and a low-voltage circuit breaker; all combined in a completely enclosed, factory assembled, wired and tested unit substation complete. The A. C. motors most suitable for pump drives are the squirrel-cage

or wound rotor induction type and the synchronous type. The synchronous motor must operate at its synchronous speed or not at all. The squirrel-cage can operate with a slip of 2.5 to 4%. The wound rotor is used chiefly where the pumps require speed adjustment.

Francis S. Friel—"Pumping Stations for the Medium-Size City"; *Jour. Am. W. W. Ass'n*, December.

#### New Automatic Pressure-Flow Control

Richmond, Va., has recently installed an automatic system of pump control which is actuated both by pressure and by flow. The pump is started when the pressure falls below a predetermined

minimum, and continues to operate so long as it delivers water at a minimum predetermined rate, regardless of the pressure, stopping when the delivery rate falls below this; therefore the pump always operates at high efficiency. The equipment required is a pressure switch to start the pump, and an electrical contact actuated by a water-flow meter in the pump discharge. The advantages of the system are:

1. Maximum efficiency of pumping.
2. Minimum disturbance that always results from stopping and starting the pumps.
3. A material reduction in the cost of elevated storage tanks.
4. Freedom to place the pumps and tanks at the most desirable location, regardless of the distance between them.
5. The elimination of the necessity for remote control.
6. The control of pressures at any point in the distribution system.
7. The possible postponement or even the elimination of the necessity for expensive main enlargements.
8. What is probably most important, an escape from the present high cost of manual operation of pumping stations, by an automatic control that is fully as flexible and almost as reliable as manual control, and yet is without the limitations of previously available automatic systems.

Marsden C. Smith—"A New Automatic Pressure-Flow Control System"; *Jour. Am. W. W. Ass'n*, December.

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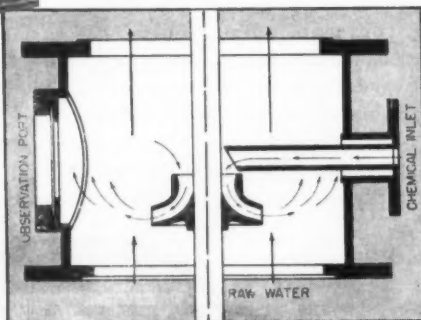
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Lining 62" and 36" Pipe Returns 13% on Cost. By John B. Dean, Water Div. Engr., St. Louis, January, Pp. 20-21, 26.  
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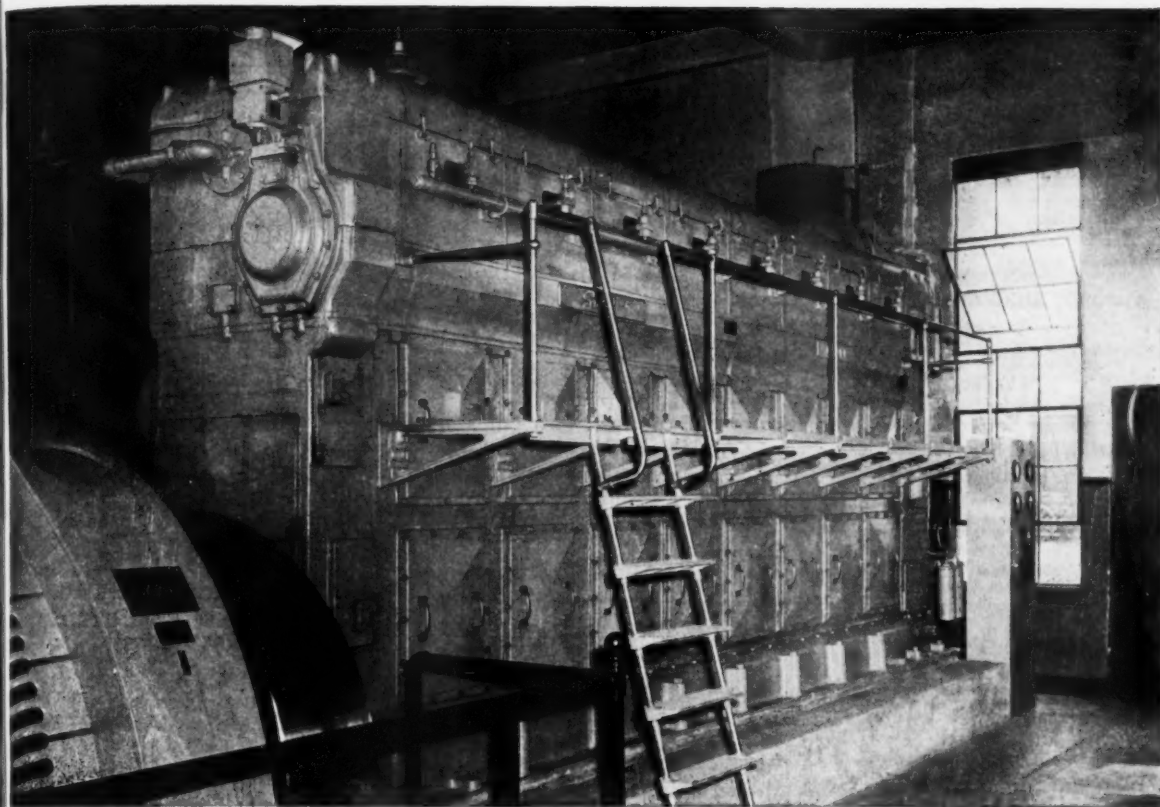
##### Technique Sanitaire et Municipale (France)

La Lutte Contre la Corrosion des Canalisations Souterraines. By A. J. Maurin, Chief of Corrosion and Protection Service of Gas Installations, July-August, Pp. 88-99.

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Developments in the Water Works Field During 1948. By Rolf Eliassen, Prof. San. Eng., January, Pp. 1-10.  
Small Water Treatment Plants. By Thos. A. Lathrop, Prin. Asst. Engr., Ohio State Dept. of Health, January, Pp. 14-16.





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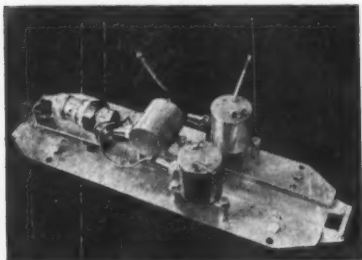
PUBLIC WORKS Magazine, 310 East 45th St., New York 17, N. Y.



# PUBLIC WORKS Equipment News

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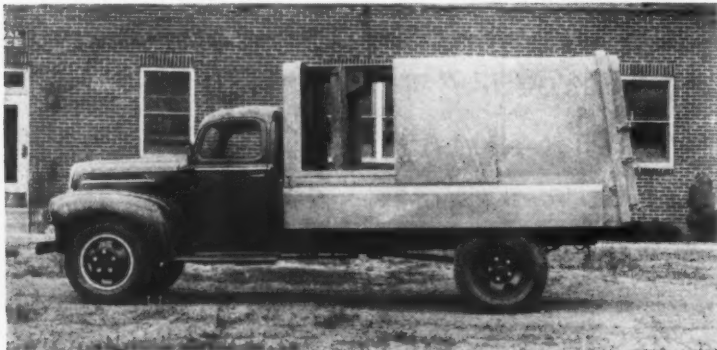
Weyeget lateral locator.

make contact with the circumference of the pipe and, by an electrical contact, locate accurately the opening. The indicator, by means of three types of audible signals, indicates whether the opening is on the right, left or top of the pipe. The counter, which reads to a tenth of a foot, measures the distance from the manhole to the opening. The sewer may be flowing full, but it must be reasonably free from roots and obstructions. A complete survey of a 300-ft. line can be made in about 30 minutes. Full data from *Alex. W. Ely & Associates, 1604 Hoyt St., Madison 5, Wisc.*

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## Hydropaka for Better Garbage Collection

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The Hydropaka for garbage collection.

more than two average loads into the space normally required for one. The body is metal, wholly enclosed, and with all openings rubber sealed. One lever controls all operation. A sump is furnished under the body for collecting liquid squeezed out of the garbage. This can be dumped separately, reducing the moisture content of the refuse. Made in 9-yd. and 12-yd. capacity. Loading height 50 ins. Dumping is quick and complete. For full data write *Marion Metal Products Co., Marion, Ohio.*

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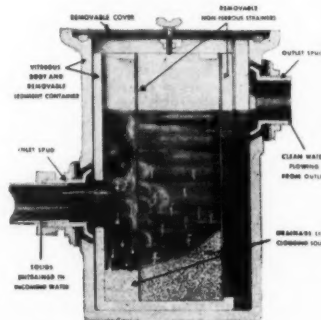
Truck tracks are easy to apply.

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## Interceptor for Building Drainage Lines

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Zurn drainage interceptor.

\* plaster, etc., from entering the building drainage lines. It is easily and quickly cleaned. Interception and removal of the solids is accomplished by two perforated metal strainers, which also serve as baffles and function as a trap. Full data from *J. A. Zurn Mfg. Co., Erie, Pa.*

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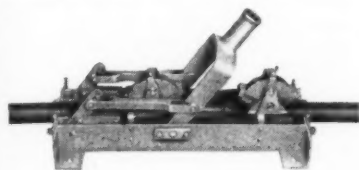
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Trojan pipe pusher-puller.

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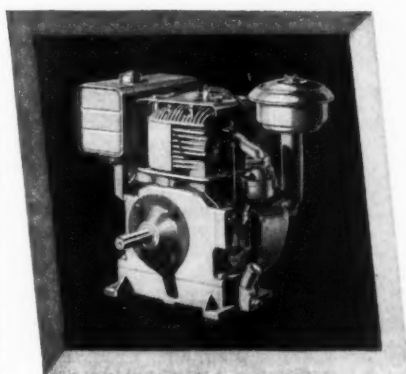
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**2-Way Radiophone.**—Five excellent folders are available on: 2-way mobile radiophone; long-distance 2-way radiophone; and 20, 85 and 400-watt instruments. Belmont Radio Corporation, 5921 West Dickens Ave., Chicago 39, Illinois.

**Mathieson Chlorine.**—This is a new 36-page book intended primarily to provide information on the proper handling of chlorine, including shipment and storage, safety and first aid. Also contains many tables and charts of help to the water works and sewerage engineer. Mathieson Chemical Corp., 60 East 42nd St., New York 17, N. Y.

**Macadam Base Construction.**—More than 16 pages of well illustrated text show how to overcome difficulties in even distribution and leveling and describes important details in construction. Seaman Motors, Inc., 305 N. 25th St., Milwaukee 3, Wisc.

**Chlorine.**—A new technical manual on chlorine; 72 pages, well bound and illustrated. Designed for use by operators, technicians and managers, it presents charts, diagrams and photographic illustrations, covering properties, use, shipping, safety, etc. Columbia Chemical Division, Pittsburgh Plate Glass Co., Fifth Ave. at Bellefield, Pittsburgh 13, Pa.

**Ionic Exchange.**—Zeolite ionic exchange equipment for water treatment, including softening and demineralization, are described in a 16-page booklet by Graver Tank & Mfg. Co., East Chicago, Ind.

**Diesel Engines.**—A 24-page profusely illustrated booklet describes the design features, specifications and work capacities of six International diesel engines, 39 to 180 hp. International Harvester Co., 180 No. Michigan Ave., Chicago 1, Ill. Ask for A-54-LL.

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## Cleary Heads Ohio Valley Sanitation Comm.

Edward J. Cleary, who has been executive editor of Engineering News-Record, has been appointed executive director and chief engineer of the Ohio River Valley Water Sanitation Commission. Mr. Cleary brings to his new job a broad viewpoint and experience in engineering, and *Public Works* feels that the Commission is to be highly congratulated on his selection.

Every city in the Ohio River basin has received notification to proceed "within a reasonable time" with a sanitation program that will comply with the Water Sanitation Compact which became a law in eight states last July. Industries in the Ohio Valley will soon receive similar notices. More than a thousand municipalities may be affected.

Four southern states, parts of which are in the Cumberland and Tennessee River basins, have been invited to join the compact. Meantime, offices have been established in Cincinnati, and progress is being made in organizing technical and administrative personnel.

## Sewage and Industrial Waste Training

The School of Public Health of the University of Michigan will conduct an in-service training course in sewage and industrial waste disposal, March 14 and 15, at Ann Arbor. A special faculty has been provided for this course. More information can be obtained from H. E. Miller, Resident Lecturer in Public Health Engineering.

## National Electrical Safety Code

This 408-page book contains the first five parts of the fifth edition of the National Electrical Safety Code. Part 1 covers installation and maintenance of electrical supply stations; Part 2, electric supply and communication lines; Part 3, electric utilization equipment; Part 4, operation of electric equipment and lines; and Part 5, radio installations. For sale by the Government Printing Office, Sup't. of Documents, Washington, D. C., for \$1.25.

## Properties of Light-Weight Aggregate Materials

This is a mimeographed book of 173 pages, with numerous charts and tables covering the physical characteristics of a considerable number of compositions containing cement-bonded light-weight aggregates. These included organic and inorganic fibers, slate pellets, and many admixes and binders. A total of 675 mixes is described, with mixing techniques, formulas for mixes and other information. The material was prepared by Corwin D. Willson, and this is a government report, but it can be obtained only from Hobart Publishing Co., Box 4127, Chevy Chase, Washington, D. C. The price is \$7.50.

## FSWA Meets in Boston

The 22nd annual meeting of the Federation of Sewage Works Associations will be held at the Hotel Statler, Boston, Mass., October 17-20.

## National Supply Co. History

A 48-page history not only of a company but of the oil industry. Beautifully prepared; with outstanding illustrations, both drawings and photographs. Based on original research and fully checked. National Supply Co., Pittsburgh, Pa., makers of engines, will send a copy on request.

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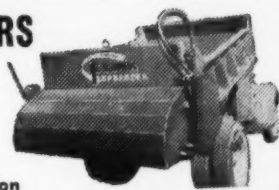
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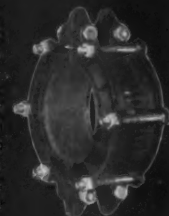


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#### Your Property Is Worth Good Protection

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#### How to Keep Your Loader On the Job

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123. For every step in lawn care and seasonal maintenance hints be sure to read "Lawn Care," an interesting periodical sent without obligation by O. M. Scott & Sons Co., 80 Spring St., Marysville, Ohio.

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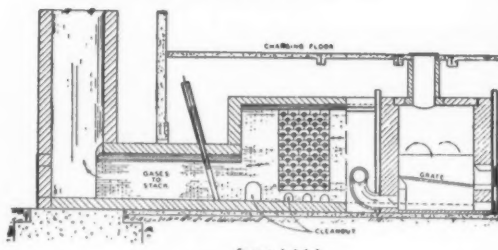
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## SEWERAGE AND REFUSE

### How to Lower Costs Of Refuse Collection

35. For saving trucks, labor, and time in city rubbish collection get details of the new Dumpster-Kolektor described in literature just published by Dempster Brothers, Inc., 996 Higgins, Knoxville 17, Tenn.

### Packaged Sewage Treatment—Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

### How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass.

### Design Details for Sludge Collectors

42. Booklet No. P.W. 1742 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, illustration pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

### For Quicker Garbage Collection

77. Designed to ease the job and last longer under hard usage, carry contents of several home garbage pails in one trip. Reinforced, welded seam steel collection

can is available in 16, 20 and 24-gal. capacity. Information from W. T. Pettit & Sons, Inc., 129 So. Center St., Youngstown,

### All About the Aero-Filter System

82. Here is a complete, illustrated treatise on the Halverson-Smith process for sewage and waste treatment. Gives valuable Aero-Filter design information with expected performance data, 16 pages of helpful information. Write Yeomans Brothers Co., 1425 No. Dayton St., Chicago 22, Ill.

### How Cities Can Do Complete Sewer Cleaning From Street

98. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Power machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana.

### Useful Design Data on Sedimentation Tanks

99. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, Dept. P.W., 570 Lexington Ave., New York 22, N. Y.

### Pumps Suitable For Every Purpose

100. Large size trash pumps, propeller pumps, angle-flow pumps—a type suitable for every service. A separate bulletin for each is furnished by Fairbanks, Morse & Co., Fairbanks-Morse Bldg., Chicago 5, Ill.

### How to Make Sewage Plant Grit Suitable for Fill, Roadways

138. The Jeffrey "Jigrit" washer does a thorough job of scrubbing grit free of organic solids. Grit is classified according to size and organics rejected with overflow. 44-page Catalog 775A describes the "Jigrit" and gives engineering data and installation views of grit and sludge collectors, chemical feeders, garbage grinders and other equipment as well. Dept. PW, Jeffrey Mfg. Co., 948 N. Fourth St., Columbus 16, Ohio.

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### Do You Have the Best Possible Sludge Conditioning?

110. "Ferri-Floc," description and instructions for use in coagulation, sludge conditioning and treating industrial wastes, fully treated in a 24-page pamphlet. Tennessee Corp., 619-27 Grant Bldg., Atlanta 1, Ga.

### An Incinerator Necessity

139. Recuperator tubes made from Silicon Carbide and "Fireclay" corebustors for maximum efficiency are described and illustrated in Bulletin 11 issued by Fitch Recuperator Co., Dept. PW, Plainfield Natl. Bank Bldg., Plainfield, N. J.

## WATER WORKS

### Do Your Water Mains Need Cleaning?

38. Literature on Flexible method of cleaning water mains any size from 2" to 72", giving full details and list of nearest representatives in all parts of country. Address: Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles, Calif.

### Solve Corrosion Problems With This Special Alloy

41. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. Dept. P.W., the American Brass Co., 25 Broadway, N. Y. C.

### Eliminate Taste and Odor From Your Water

53. Technical pub. No. P.W. 213 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with Break-Point Chlorination. Send free to any operator requesting it.

### Have You a Water Conditioning Problem?

56. Installation-tested equipment for complete municipal and industrial systems or individual units. Illustrated and described in latest booklets from Dept. P.W., American Wells Works, Aurora, Ill.

### Chem-O-Feeders for Automatic Chemical Feeding

60. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation, treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioners, Inc., 96 Coddling St., Providence 1, R. I.

### Helpful Data on Hydrants

64. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M. & H. Valve & Fittings Co., Dept. P.W., Anniston, Ala.

### Cast Iron Pipe and Fittings For Every Need

65. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. PW, Burlington, N. J.

### Job Data Offered on New Steel Water Lines

80. An 8-page illustrated report listing pipe diameters, pipe wall thicknesses, line pressures, coatings, engineering personnel, etc., is entitled "A Report of Dresser-Coupled Steel Water Lines in the Year 1947." A copy will be sent by Dresser Mfg. Div., Bradford, Pa.

### How to Estimate Quantity Of Joint Compound Needed

87. The uses of Tegul-Mineral lead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

### Flow Meters With Many New Features

91. The new Propelflo meter for main-line metering introduces many new features you will want to look into. Send for latest bulletin today. Builders Providence, Inc., 16 Coddling St., Providence 1, R. I.

### Cast Iron Pipe Handbook—Handy Pocket Size

97. Catalog of Universal Cast Iron Pipe and Fittings, pocket size, illustrated, including useful reference tables and data. Sent by The Central Foundry Co., Dept. P.W., 386 Fourth Ave., New York 16, N. Y.

### Just Press the Button—It Does the Rest


103. Automatic Filter Operation. The Robotrol automatically back washes, re-washes and returns the filter to service. Illustrated Engineering Bulletin 1230. Inflico, Inc., 325 W. 25th Place, Chicago 16, Ill.

### Pipe That Is Immune to Tuberculation and Corrosion

104. Transite Pipe. The high strength and low weight of pipe moulded under pressure from asbestos fibre and cement, together with its immunity to tuberculation and corrosion is the subject of a 32-page pamphlet. Johns-Manville, Box 290, New York 16, N. Y.

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105. Layne pumps are built for wells ranging from 4" to 36" diameter and in capacities from 50 to 16,000 gpm. Full engineering data and many installation views are given in 32 page Pump Bulletin 4-42. Layne and Bowler, Inc., Memphis, Tenn.

## Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., P.O. Box 269, East Orange,

## Full Data on Method and Results Of Water Main Cleaning

107. Water main cleaning by the National Method is title of 4-page folder describing methods and results obtained, with full data. National Water Main Cleaning Co., 30 Church St., New York 7, N. Y.

## You Can Depend On These Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

## The Modern Way to Filter Swimming Pool Water

129. That's the title of a bulletin full of facts about Bowers' new diatomite filter to produce clear, sparkling, clean water at low cost. Occupies small space, doesn't waste water. Gives sizes to use, performance charts, etc. Write Bowser, Inc., Dept. PW, Ft. Wayne, Ind.

## Find Buried Pipe The Goldak Way

131. Finding buried pipe is easy with the new Featherweight Goldak Pipe Locator. An easy-to-read illustrated bulletin tells the full story quickly. Address: The Goldak Co., 1544 Glenoaks Blvd., Glendale 1, Calif.

## Double-Duty Softener And Dealkalizer

132. A 12-page booklet describes how this double-duty Zee-Karb softener, and dealkalizer works and how it is applied to various industrial problems. Ask for Bulletin 2418. The Permutit Company, 330 West 42nd St., New York 18, N. Y.

## How Elevated Water Tanks Can Save on Operating Costs

134. Beautiful new booklet on Horton elevated steel water tanks suggests ways to reduce pumping costs, increase capacity of systems, maintain uniform pressure, etc. Illustrates 7 models of welded, ellipsoidal-bottom, elevated steel tanks in full color. Write Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4.

## A New Answer to Some Old Waterworks Problems

135. That is what they call "Hypo-Chlorination of Water," a 48-page illustrated discussion of this live subject, in a booklet packed with helpful information. For your copy, address: Mathieson Chemical Corp., Dept. PW, 60 E. 42nd St., New York 17, N. Y.

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Winston-Salem, N. C. (80,000) wishes to employ well-qualified engineer for position of Supt. of Water Works and Sewerage. Give complete information as to education, experience, references and salary desired. Applications will be kept confidential on request. Address C. E. Perkins, City Manager, City of Winston-Salem, N. C.

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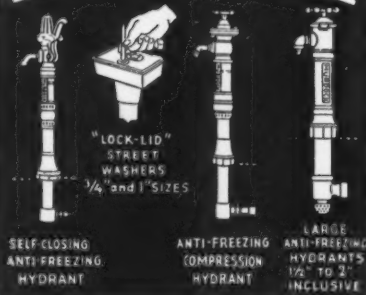
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## NEWS OF ENGINEERS

Dewitt S. Abell, well-known sanitary engineer, has been appointed engineer for the Institute of Inter-American Affairs in Uruguay. He has recently returned from China where he was chief sanitary engineer for UNRRA.

Franklin Thomas, professor of Civil Engineering and Dean of Students at California Institute of Technology, has been elected president of the American Society of Civil Engineers. Two new vice-presidents have also been elected, both consulting engineers. They are: Henry J. Sherman of Camden, N. J., and Robert B. Brooks of St. Louis.

John P. Kleber has been made manager of the Division of Municipal and Process Waters, Calgon, Inc., Pittsburgh, succeeding Owen Rice, who has been made vice-president in charge of industrial chemical sales. George Illig, Jr., is assistant to Mr. Kleber.

Ladis H. Csanyi will become professor of civil engineering at Iowa State College, Ames, Ia., on March 1. Mr. Csanyi has had a wide experience in general civil engineering.

Edmund N. Bacon has been appointed Executive Director of the Philadelphia City Planning Commission, succeeding the late Raymond F. Leonard.

A. H. Paessler is now Acting Executive Secretary of the Virginia State Water Control Board, succeeding L. L. Hedgepeth, who has resigned.

William S. Hawkins has been made Division Sales Manager for Osgood Co. and General Excavator Co., covering Texas, Oklahoma, Kansas, Missouri, Iowa and part of Nebraska. His headquarters will be at Topeka.

John A. Sargent, former vice-president of finance for Diamond Alkali Co., has been appointed executive vice-president.

Major General Clinton F. Robinson, Corps of Engineers, Retired, has become associated, as vice-president, with Frederic R. Harris, Inc., consulting engineers, New York, Philadelphia, San Francisco and Mexico City.

Stephen W. Benedict has been made director of research for Master Builders Co., Cleveland, Ohio.

John J. Mahoney has been appointed Director of Engineering for Foster D. Snell, Inc., chemists and engineers, New York.

Erwin H. Thormahlen has been appointed sales manager of the Industrial Division of Modern Water Equipment Co., West Chicago, Ill., manufacturers of domestic, industrial and commercial water softeners and filters. Kenneth G. Sims is general manager of the company, which recently moved into its large new plant.



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A. W. W. A. type iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position.



M & H furnishes both regular type A. W. W. A. fire hydrants and special Traffic Model designed to yield at the ground line under impact.

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